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Emergency in Urology

Objectives

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

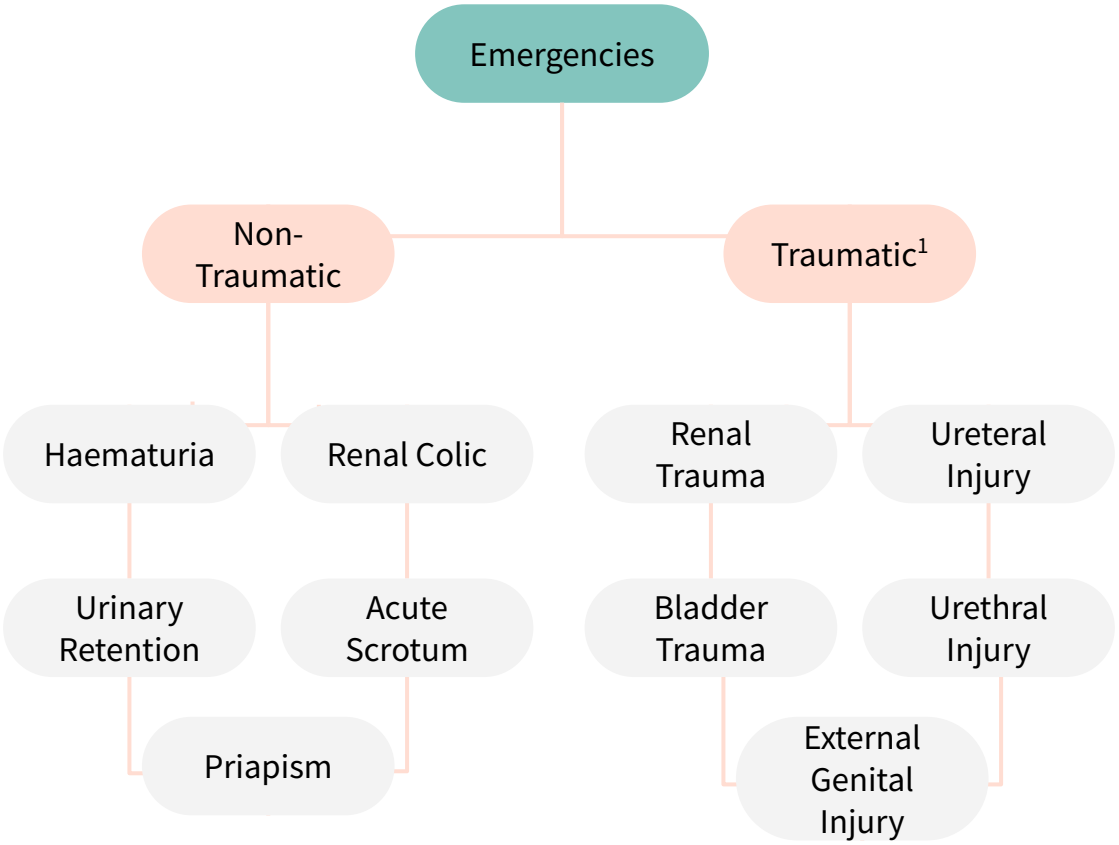
Colour Index

- Main Text
- Males slides
- Females slides
- Doctor notes
- Textbook
- Important
- Golden notes
- Extra

Editing File

Introduction

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



- Haematuria is the most important symptom that need immediate medical help.
- Pain is the most important symptom that brings the patients to the emergency.

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%

1. Usually traumatic injuries are present in more than one organ

Non traumatic Urological Emergencies : Haematuria

Causes of haematuria vary according to:

1 Patient's Age

2 Symptomatic or Asymptomatic

- **Painful** → indicates renal stones or UTI.
- **Painless** → indicates malignancy.

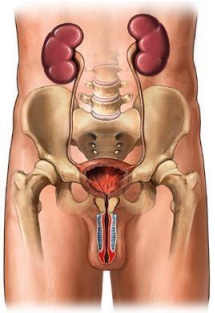
3 Existence of malignancy risk factors

E.g. **smoking**, as it's the **most common** risk factor for renal tumors (**Painless, gross hematuria**).★

4 The type : gross & microscopic (Important)

- 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.**

5 Timing (Important)



1. **Initial "before urine"** = suspect urethra (post-renal).
2. **Terminal "after"** = suspect neck of bladder or sphincters.
3. **Total "along with urine"** = suspect kidney or ureter (renal).

5 Presence of clots

- One of the most important determinant is the presence of clots & its amount.
- 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**)

Non traumatic Urological Emergencies : Haematuria

History

Age
Malignancy associated with middle age ~40

Residency
Higher incidence of schistosomiasis in Egypt

Occupation
people who work in paint and tire "rubber" factories have a high chance of Bladder tumor.

- **Pain or painless**
- **Timing & Clots**
- **Duration**

Associated symptoms
Fever = UTI
Dizziness = severe bleeding

Color
Brownish urine is a sign of pre-renal cause "hemolytic anemia"

- **Past history:** of bleeding disorders, TB, SC, Bilharziasis & stones.
- **Family History:** Malignancy or haematological disorders.
- **Consumption of Colored food or drinks:** Beetroot & Some candies especially cotton candies.

Trauma or bleeding from other sites

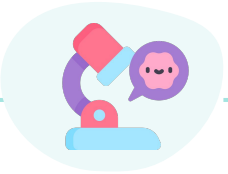
- **Smoking** (Key risk factor for Bladder tumor)
- **Drugs**
  - Like aspirin, heparin, warfarin

Physical Examination, Investigations & Management:

Physical Examination

- Usually no much signs
- Digital Rectal exam is an **obligatory step** in physical examination.

Investigation



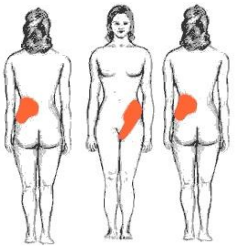
- We have to do: Urine culture & Urinalysis (to detect UTI), Electrolytes (to detect renal impairment), Urine Cytology (to detect malignant cells), CBC, and coagulation profile. The presence of WBC casts and RBC casts is strongly indicative of glomerulonephritis.
- The **single most important imaging modality** for a patient with gross hematuria is **CTU (CT Urography) with contrast**. This is the **gold standard method**.

Management

- Insert 3 way foley urethral catheter and bladder wash out for heavy bleeding.
- Treat according to the cause.

Non traumatic Urological Emergencies : Renal colics

- The most common urological emergency (in Saudi Arabia cases are seen daily).
- One of the most common causes of differentials associated with "Acute Abdomen"



01 Clinical Features

- 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

- 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)
- 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

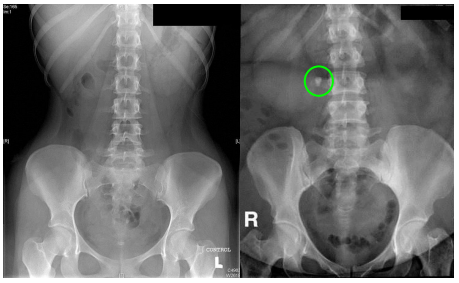
- Start with history "first 2 lines in clinical features is the typical presentation"
  - History may be mixed with other complications as UTI > Presence of fever
  - Or if there's complete obstruction, the leading symptoms will be "persistent" pain rather than colicky as the continuous peristalsis tries 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

Non traumatic Urological Emergencies : Renal colics

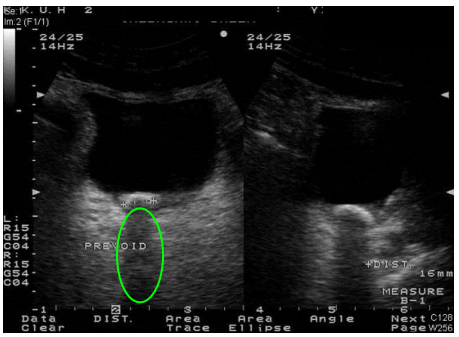
04 Investigations

- **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 (high creatinine, Hyperkalemia).
- Radiological testing:
  - **U/S:** Acoustic shadowing.
  - **X-Ray:** not very accurate, 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
  - ★ **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



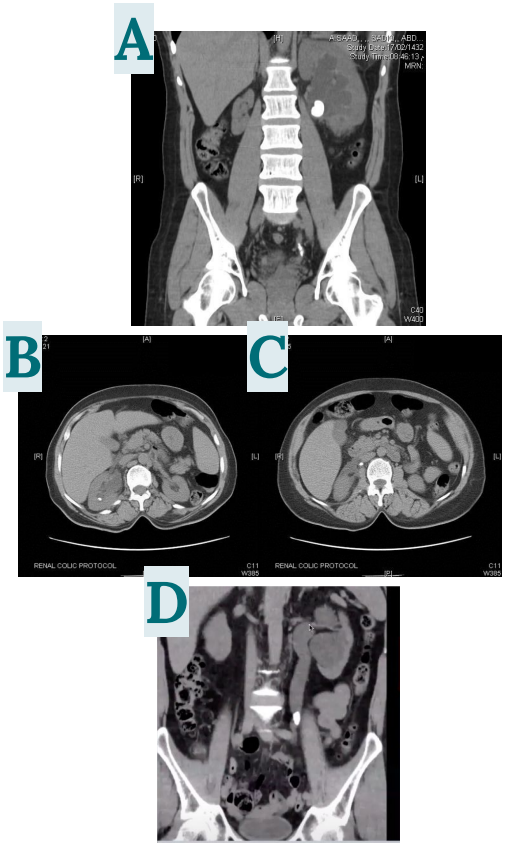
Renal U/S (RUS)

- **Hyperechogenic area** with **Acoustic shadow** indicate stones.

Intravenous urography (IVU)

- You can see the stones blocking the ureter
- Not used anymore because the contrast is nephrotoxic.

Non traumatic Urological Emergencies : Renal colics



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

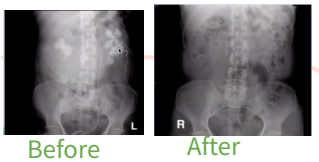
05 Management (Medical or surgical)

Medical

- **Hydration** (mainly drinking, or I.V if needed)
  - **5mm Stone or less:** 'watchful waiting' with analgesic supplements is the best approach; 95% of 5mm or less stones **pass spontaneously**
- **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
- **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.

Non traumatic Urological Emergencies : Renal colics

05 Management


Before treatment

After treatment

Surgical

- To Relieve Obstruction and/or Remove the stone.
- **Indications for Intervention:**
  1. **Obstruction Unrelieved** (not to exceed 4 weeks!=Necrosis) "patient came after 2 weeks & the obstruction haven't relieved"
  2. **Pain that fails to respond to analgesics** "Comes back to clinic before the scheduled 2 weeks".
  3. Association With **Fever** (fever highly suggests pyelonephritis which requires drainage because it may cause septicemia)
  4. **Renal Function Impairment** (creatinine & Potassium) caused by stone (Solitary kidney obstructed by a stone, bilateral ureteric stones).
  5. **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)

01

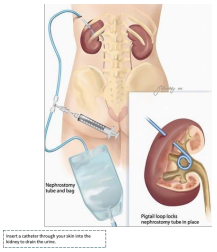
Temporary
(Urine is diverted first, then the stone is treated)

Insertion of JJ stent

A.K.A urinary stent, which's a thin tube that gets inserted into the ureter to divert the urine flow.

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.



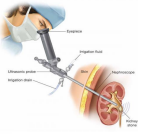
Definitive

Extracorporeal Shock Waves Lithotripsy (ESWL)

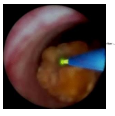
Used for small stones in the kidney or the upper ureter

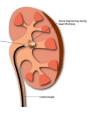
Percutaneous Nephrolithotomy (PCNL or PNL)

For large stones.



Ureteroscopy (URS) (laser) - very common



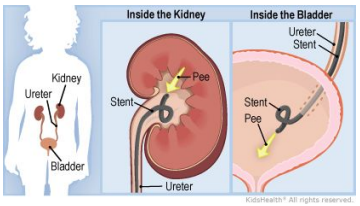


Laparoscopic extraction

Rarely used

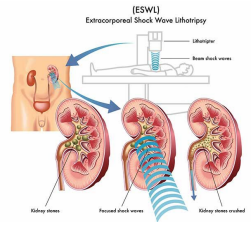
Open surgery

Very limited



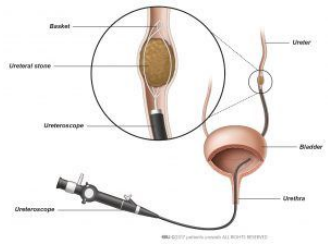
JJ stent (Double J stent "DJ stent")

- 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.



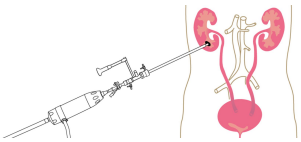
Extracorporeal Shock Waves Lithotripsy (ESWL)

- 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 (URS) (laser)

- 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)

- 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.

Laparoscopic extraction

- 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.

Non traumatic UE : Urinary Retention

1 Acute urinary retention

Acute Urinary Retention: Painful inability to void , 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).

Causes

In men	In women (Rare)
• **Benign prostatic enlargement (BPE) due to BPH** (The most common cause). • Carcinoma of the prostate • Prostatic abscess • Urethral stricture • Stones • Constipation (In children)	• 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**

Management

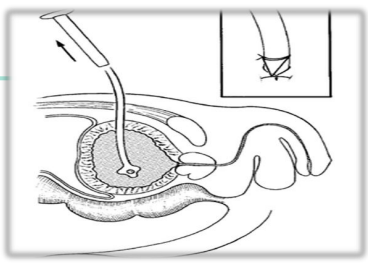
01

Initial management is to drain urine by catheterization::

1. **First option:** Urethral catheter


Foley catheter

2. **Second option:** Suprapubic catheter -through skin-



02

Late management is to treat underlying cause

Non traumatic UE : Urinary Retention

2 Chronic urinary retention

- **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 occured)
- Usually associated with
  - Reduced renal function
  - Upper tract dilatation & diabetes (neuropathy)

Presentation

- 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).

Management

- 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)

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

FOAMWISE

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**

Non traumatic UE : Acute Scrotum

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

Differential diagnosis

- **Torsion of the spermatic cord (Most serious)**
- Torsion of the appendix epididymis
- **Epididymo-orchitis**
- Trauma/ insect bite
- Inflammatory vascultits
- **Epididymitis (most common).**
- Torsion of the appendix testis
- Orchitis
- Hernia
- Dermatological lesion
- Neurological (adductor tendonitis)

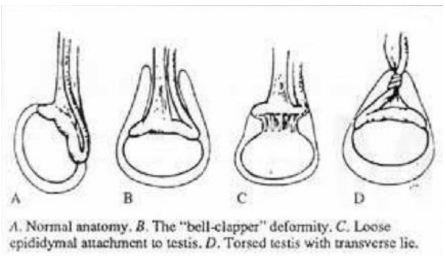
1 Torsion of the spermatic cord

01

- Common among teenagers (12-18) years.
- Unlikely after the age of 25 .
- Possible in children and neonates.

02

- True surgical emergency of the highest order.
- Irreversible ischemic injury to the testicular parenchyma may begin as soon as **4 hours** (you have 4 hours to save testicles).
- **Testicular salvage ↓ as duration of torsion ↑ (Ischemia then necrosis)**



A. Normal anatomy. *B*. The "bell-clapper" deformity. *C*. Loose epididymal attachment to testis. *D*. Torsed testis with transverse lie.

Anatomical variations

- Picture A: this is the normal position of tunica vaginalis)in which it covers anterior wall & part of posterior wall of testcles.
- Picture B: This is "Bell-clapper" deformity in which the in which Vaginalis is floppy, which lead to hang the testcles as in Picture D.

Non traumatic UE : Acute Scrotum

Signs & Symptoms

Symptoms

- Acute onset of scrotal pain (Very severe pain). That's located in 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)

Examinations

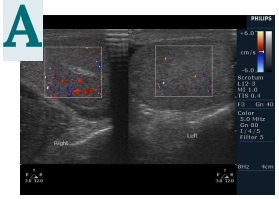
- The affected testis **is high riding**
- Acute hydrocele or massive scrotal edema
- Tender larger than other side
- **Transverse -not vertical-** orientation
- **Cremasteric reflex is absent in torsion.**
- **Elevation of the scrotum causes more pain** (to differentiate from epididymitis)
- **Redness & inflammation only in Orchitis. Here, there's no redness**

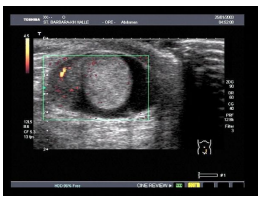
Torsion investigations (Adjunctive tests)

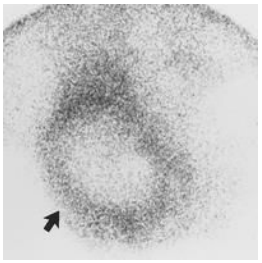
(If the diagnosis is clinically suspicious don't delay the patient for any investigations).

- If we delay the diagnosis we may lose testicle
- To aid in differential diagnosis of the acute scrotum.
- Or to confirm the **absence** of torsion of the cord.
- Doppler examination of the cord and testis
    - High false-positive and false-negative

A







Color-Doppler U/S

- 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.
- **Picture A: red color is sign of proper blood flow, Torsion confirmed if there's no flow.**

RadioNuclide Imaging

- You don't need to know about it :)
- Assessment of testicular blood flow.
- A sensitivity of 90%, & specificity of 89%.
- False impression from hyperemia of scrotal wall.

Non traumatic UE : Acute Scrotum

Torsion Management

Surgical Explorations: (orchiopexy)

- 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 occured in one testis, usually it occurs in the other one. You have to examine both testcles.)

2

Epididymo-orchitis

Presentation:

- Indolent process.
- Scrotal swelling, **erythema, and pain** (can be a complication of either UTI or Urethritis).
- Dysuria and fever is more common
- If there was fever: consider abscess

Physical Examination

- localized epididymal tenderness, a swollen and tender epididymis, or a massively swollen hemi-scrotum with absence of landmarks.
- **Cremasteric reflex should be present**

Urinalysis

- pyuria, bacteriuria, or a positive urine culture

Management

- Bed rest for 1 to 3 days then relative restriction
- Scrotal elevation, the use of an athletic supporter
- **Oral antibiotics therapy** (**Bactrim-TMP**) should be used unless the patient is sick.
- Urethral instrumentation should be avoided

Non traumatic UE : Priapism

Priapism: Persistent erection of the penis for more than **4 hours** that is **not related or accompanied** by sexual desire. Not common, but we see it usually in sickle cell patients.

Types of Priapism

Ischemic (most common)	Non-Ischemic
• (veno-occlusive, **low flow**) ”Occlusion of venous return” -	• arterial, **high flow**
• Due to hematological disease The most common, mainly Sickle cell), malignant infiltration of the corpora cavernosa with malignant disease, or drugs (+users of cocaine or Heroin). • **Painful**	• Due to perineal trauma, which creates an arterio-venous fistula. • **Painless-not an acute presentation** • Usually we don’t see these patients coming to the ER

01

Primary

(Idiopathic):
30% - 50 %

02

Secondary

Drugs, Trauma, Neurological, Hematological disease(The most common, mainly Sickle cell), Tumors, spider bite (Phoneutria nigriventer; spider name).

Diagnosis

- **Usually obvious from history**
- Duration of erection >4 hours?
- Is it painful or not?.
- Previous history and treatment of priapism (sickle cell) ?
- Identify any predisposing factors and underlying cause

Examination

- Erect, tender penis (in low- flow)
- Characteristically the corpora cavernosa are rigid and the glans is flaccid.
- **Abdomen** for evidence of **malignant** disease
- DRE: to examine the prostate and **check anal tone**.

Non traumatic UE : Priapism

- CBC (white cell count and differential, reticulocyte count).
- Hemoglobin electrophoresis for sickle cell.
- Urinalysis including urine toxicology (For drug users-abusers).

Investigations

- Blood gases taken from either corpora
- It's a diagnostic & Therapeutic test for priapism.
- We do ABG at the same time of aspirate the blood from corpora.

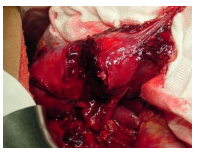
	Low flow (Ischemic)	High flow (Non-Iscemic)
Blood color	dark blood	bright red blood similar to arterial blood at room temperature
PH	<7.25 (**acidosis**)	= 7.4 (normal)
PO2	pO2 <30 mmHg (hypoxia)	pO2 >90 mmHg (normal)
PCO2	pCO2 >60 mmHg (hypercapnia)	pCO2 <40 mmHg (normal)

- Color flow duplex ultrasonography in cavernosal arteries (the best diagnostic method for non-ischemic priapism to detect the fistula);
  - Ischemic (inflow low or nonexistent)
  - Non-ischemic (inflow normal to high)

Treatment

- Depends on the type of priapism (In sickle cell: we do oxygenation, hydration, give morphine to decrease the pain & dislodge the clot.)
- Conservative treatment should first be tried
- Medical treatment (alpha-agonist may relieve priapism)
- Surgical treatment.
- Treatment of underlying cause

Traumatic Urinary Emergencies : renal trauma



- Emergencies
  - Non-Traumatic
    - Haematuria
      - Urinary Retention
    - Renal Colic
      - Acute Scrotum
    - Priapism
  - Traumatic
    - Renal Trauma
      - Bladder Trauma
    - Ureteral Injury
      - Urethral Injury
    - External Genital Injury

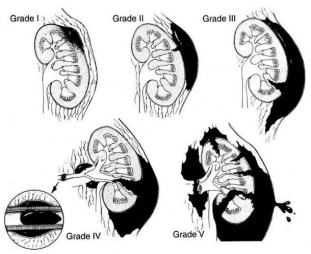
- The kidneys relatively protected from traumatic injuries
- considerable degree of force is usually required to injure a kidney.
- The kidneys are anatomically well protected (by the vertebral column & Rib cage) any injury to the kidney especially when it's blunt it should be massive or rapid accelerated and decelerated injury.

Mechanism of renal trauma

Blunt:
direct blow or acceleration/ deceleration,e.g., road traffic accidents, falls from a height, fall onto flank

Penetrating
knives, gunshots, iatrogenic, e.g., percutaneous nephrolithotomy (PCNL)

Staging (Grading) by CT scan



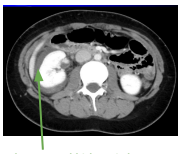
- Doctor said you don't need to remember this :)
- Just understand the last point

- Grade I : small hematoma around the kidney
- Grade II: +Ulceration into the kidney (<1cm)
- Grade III: If the ulceration >1cm but didn't reach the the collecting system (calyx of the kidney)
- Grade IV: If the tearing reached the calyx with urinary extravasation
- Grade V: If kidney teared into pieces.
- Grade I, II, III, and even IV treated conservatively (As long as the patient BP is stable), While Grade V treated surgically right away.
  - 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.

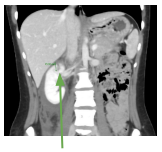
Traumatic Urinary Emergencies : renal trauma

Renal Imaging Indications

- Macroscopic haematuria
- Penetrating chest, flank, and abdominal wounds
- Microscopic [>5 red blood cells (RBCs) per high powered field] or dipstick with picture of hypertension (low blood pressure and tachycardia)
- Hypotensive patient (SBP <90mmHg)
- A history of a rapid acceleration or deceleration injury
- Any child with microscopic or dipstick or macroscopic haematuria who has sustained trauma (Do US then CT)



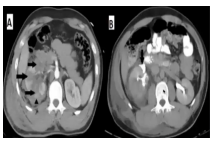
Dark color around kidney is hematoma (fluid surrounding the kidney)
Whitish color of the kidney is due to the contrast, which indicates functioning kidney.



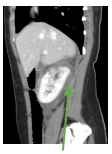
You can see the tearing here (Not reaching calyx)

Contrast extravasation

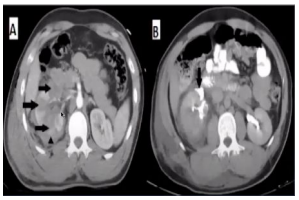
This tearing reached the calyx



the kidney is shattered into pieces



Fluid around the kidney = blood or urine



Left Picture: A kidney shattered into pieces, absence of contrast indicate the loss of blood supply
Right picture: contrast leaked outside the kidney

CT-Scan

Remember:
Renal colics: CT without contrast
Kidney trauma: CT with contrast

- **Spiral non contrast**
  - does not allow accurate staging.
- **Contrast-enhanced**
  - **(Imaging study of choice)**
  - accurate, rapid, images other abdominal structures.

IVU (Intravenous urogram) - no pictures

- 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:**
  - can certainly establish the presence of two kidneys
  - the presence of a retroperitoneal hematoma
  - power Doppler can identify the presence of blood flow in the renal vessels
- **Disadvantages:**
  - 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.

Traumatic Urinary Emergencies : renal trauma

Renal Trauma Management

01 Consevative Therapy

- The best approach for Blunt injuries unless the injury is grade V or the patient is unstable.
- In over 95% of blunt injuries.
- In 50% of renal stab injuries and 25% of renal gunshot wounds (Specialized centers)
- Includes:

01
- Wide Bore IV line
- 2 Large IV access

02
- IV antibiotics.

03
- Bed rest to contain the existing bleeding, usually for 2-3 weeks.

04
- Vital signs monitoring.
- Serial CBC and HCT
- Follow up US &/or CT. in a week or two

02 Surgical Exploration

- Usually penetrating injuries require surgical intervention.
- Persistent bleeding (persistent tachycardia and/or hypotension failing to respond to appropriate fluid and blood replacement
- Expanding peri-renal hematoma (again the patient will show signs of continued bleeding)
- Pulsatile peri-renal hematoma

Traumatic Urinary Emergencies : Ureteral Injuries

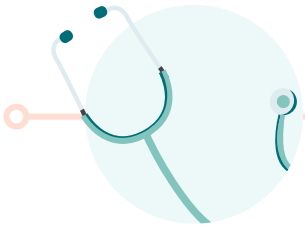
- The ureters are protected from external trauma by surrounding bony structures, muscles and other organs
- Causes of Ureteral injuries are either: **External** Or **Internal**.

External Trauma (rare)	Internal Trauma

• Rare
  ○ Severe force is required.
• Blunt external: trauma severe enough to injure the ureters will usually be associated with multiple other injuries.
• Penetrating knife or bullets to the abdomen or chest may damage the ureter, as well as other organs.
	• Uncommon
	  ○ but is more common than external trauma.
	• Iatrogenic (during surgery):
	  ★ Oncology surgeries like: **Hysterectomy** (because the ureter is really close to the uterine artery) oophorectomy, and sigmoidcolectomy.
	  ○ **Caesarean section.**
	  ○ Ureteroscopy.
	  ○ Aortoiliac vascular graft replacement.
	  ○ Laparoscopies.
	  ○ Orthopedic operations.

Traumatic Urinary Emergencies : Ureteral Injuries

Diagnosis

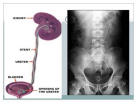


- Requires a high index of suspicion, usually diagnosed Intra-operatively.
- Late diagnosis:
  - An ileus: the presence of urine within the peritoneal cavity
  - Prolonged postoperative **fever** or overt urinary **sepsis**
  - Persistent drainage of fluid from abdominal or pelvic drains, from the abdominal wound, or from the vagina.
  - **Flank pain if the ureter has been ligated**
  - An abdominal mass, representing a urinoma
  - Vague abdominal pain

Lab

Management

- Diversion with: JJ (Double J) stenting or nephrostomy (to allow the ureter to heal by itself. This can't be applied in complete cut of the ureter.)



- If the ureter healed, no need to do anything. If not you need to connect the ureter back together by Primary closure of partial transaction of the ureter
- No need to know so much about the details of ureter surgery below :)
- Direct ureter to ureter anastomosis
- Re-implantation of the ureter into the bladder.
- Trans uretero-ureterostomy
- Auto-transplantation of the kidney into the pelvis
- Permanent cutaneous ureterostomy
- Nephrectomy

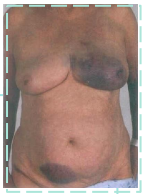
Traumatic Urinary Emergencies : Bladder Injuries

Causes:

Iatrogenic

- Transurethral resection of **bladder tumor** (TURBT)
- Cystoscopy bladder biopsy
- Cystolitholapaxy
- **Caesarean section**, especially as an emergency (Very common)
- Pelvic surgery

External

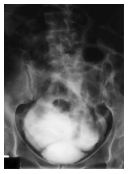


- Penetrating trauma to the lower abdomen or back
- Blunt pelvic trauma—in association with pelvic fracture or 'minor' trauma in a drunkard patient
- **Rapid deceleration injury seat belt injury with full bladder in the absence of a pelvic fracture** (Injury to both breast and bladder)

Traumatic Urinary Emergencies : Bladder Injuries

Types of Perforation

Intra-peritoneal



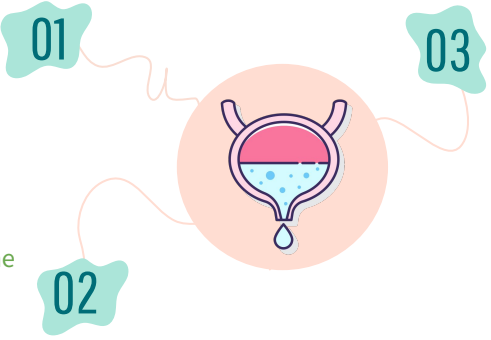
- The peritoneum overlying the bladder (It's retroperitoneal organ), has been breached along with the wall the of the bladder, allowing urine to escape into the peritoneal cavity.

Extra-peritoneal

- The peritoneum is intact and urine escapes into the space around the bladder (Between bladder and peritoneum), but not into the peritoneal cavity.

Symptoms

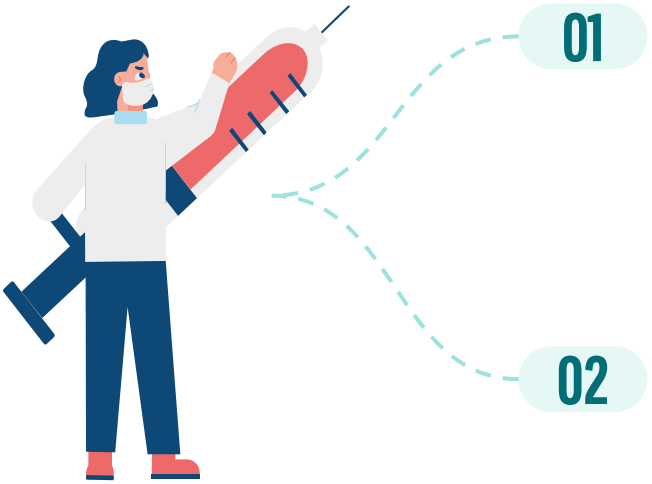
- Usually recognized **intra-operatively**



- **intra-peritoneal rupture symptoms**: The urine will leak to the intra-peritoneal space and cause
- 1- Ileus 2-Localized peritonitis.

- The classic **triad** of symptoms and signs that are suggestive of a bladder rupture :
  - Suprapubic pain and tenderness.
  - Difficulty or inability in passing urine.
  - With or w/o Haematuria.

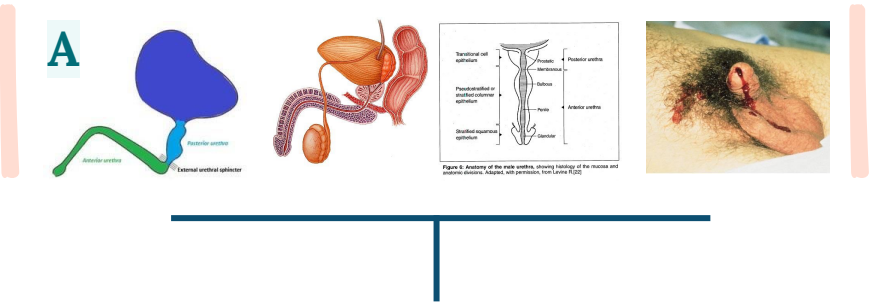
Treatment



- **Intra-peritoneal:**
- By open repair…**why?**
  - If you left it it may cause sepsis.
  - Unlikely to heal spontaneously.
  - Usually large
  - Leakage causes peritonitis
  - Associated other organ injury.

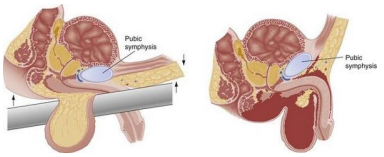
- **Extra-peritoneal:**
  - Bladder drainage +++++ (Usually Observational)
  - Open repair + (If not healed after 2 or 3 weeks)

Traumatic Urological Emergencies: Urethral Injuries



1 Anterior urethral injuries

- **Rare**
- Injury of Penile and bulbous urethra (look at picture A)
- The majority is a result of a **straddle injury in boys** (children who learn to bike & Skewers) or men
- Direct injuries to the penis
- Penile fractures
- **Inflating a catheter balloon** in the anterior urethra
- Penetrating injuries by gunshot wounds.
- It can also be caused by sexually transmitted diseases



Signs & Symptoms

- Meatal Bleeding (From external meatus)
  - Meatal bleeding is an alarming symptoms, don't insert a Foley catheter in patient with meatal bleeding
- Difficulty in passing urine
- Frank haematuria
- Hematoma may accumulate around the site of the rupture
- Penile swelling
- With\ or without urinary retention.

2 Posterior urethral injuries

- Injury of membranous and prostatic urethra (look at picture A)
- Great majority of posterior urethral injuries occur in association with pelvic fractures
- 10% to 20% have an associated bladder rupture

Signs & Symptoms

- Blood at the meatus, gross hematuria, and perineal or scrotal bruising.
- **High-riding prostate (You can't reach the prostate when applying digital rectal exam.)**

3 Urethral injuries Diagnosis, staging & Management

Anterior Urethral

- If the patient presents to you with a history suggestive of pelvis fracture e.g.. car accident you should approach the patient with ABC first.
- The diagnostic tool is **Retrograde urethrography** (**Ascending urethrogram**):

1-Contusion

- No extravasation of contrast
- Treatment: A small-gauge urethral catheter for one week

2-Partial Rupture

- extravasation of contrast, with contrast also present in the bladder
- Treatment:
- **No blind insertion of urethral catheterization** (may be by using cystoscopy and guide wire) (you may worsen the injury by mistake.) = Catheter under vision.
- Majority can be managed by suprapubic urinary diversion (catheter) for one week
- Penetrating partial disruption (e.g., knife, gunshot wound), primary (immediate) repair.

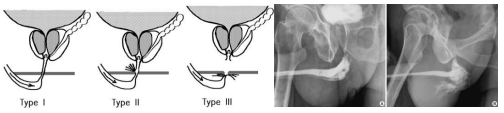
3-Complete Rupture

- No filling of the posterior urethra or bladder
- Treatment:
- patient is unstable: a suprapubic catheter.
- patient is stable: the urethra may either be immediately repaired or a suprapubic catheter

4-Penetrating Anterior Urethral Injuries

- are generally managed by surgical debridement and repair

Posterior Urethral



1- Type I

- Rare
- stretch injury with intact urethra
- Treatment: Stenting in urethral catheter (The same as contusion)

2-Type II

- 25% of posterior urethral injuries
- Partial tear but some continuity remains
- Treatment: Stenting in urethral catheter (The same as contusion)

3- Type III

- 75% of posterior urethral injuries
- Complete tear with no evidence of continuity
- Treatment:
- 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.

- In **women**, partial rupture at the anterior position is the most common urethral injury associated with pelvic fracture.

Traumatic Urological Emergencies: External genitalia

01 Male External Genitalia Injuries

- Penile Fracture, **eggplant deformity sign** (Injury mainly of corpora spongium)
- Pathology: ulceration in the tunica albuginea due to heavy sexual intercourse then the bleeding happens by the corporal body. It's an emergency treat promptly, otherwise the patient will have a life long erection problem.

- Penile amputation and injuries
- Scrotal Injuries.
- Glans Injury (Caused mainly by circumcision)

02 Female External Genitalia Injuries

- Managed by Gynecologists unless the urethra or the bladder is involved.

Fournier gangrene

1 Definition & Causes

- Defined as a polymicrobial necrotizing fasciitis of the perineal, perianal, or around genital areas "only".
- **Localized infection** adjacent to a portal of entry is the inciting event in the development of fournier gangrene.
- Ultimately, an obliterative endarteritis >>Subcutaneous vascular necrosis >> localized ischemia
- Mortality of 10-20% despite aggressive measures

Anorectal causes

- Perianal, perirectal, and ischiorectal **abscesses**
- Anal dissures or fistula (that is not treated and complicated)
- Colonic perforations, secondary to colorectal injury of malignancy
- IBD
- Colonic **diverticulitis** or appendicitis

Urogenital causes

- Urethral injury
- Iatrogenic urethral manipulation cystoscopy and other surgeries
- Epididymitis or Orchitis
- Lower urinary tract infection

Fournier gangrene

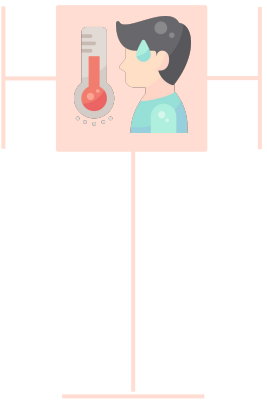
2 Most common agents & people at risk

Causative Microorganisms	Risk groups
• **Polymicrobial involvement (majority)** • And usually agents are from skin flora • **Streptococcal species** • **Staphylococcal species** • Enterobacteriaceae • Anaerobic organism • Fungi	• Any immunocompromised patient • **Diabete mellitus** • Morbid obesity • Alcoholism • Cirrhosis • Extremes of age • Malignancy "especially those with chemotherapy" • HIV infection • Malnutrition • Iatrogenic immunosuppression (E.g: long-term corticosteroid therapy or chemotherapy)

3 Signs & symptoms

History:

- Prodromal symptoms of **fever and lethargy** .
- Intense genital pain and tenderness >> erythema. (progressive)
- Dusky appearance of the overlying skin; subcutaneous crepitation (feels bubbles under the skin due to gas-producing bacteria)
- Obvious gangrene of a portion of the genitalia; purulent drainage



Physical Examination:

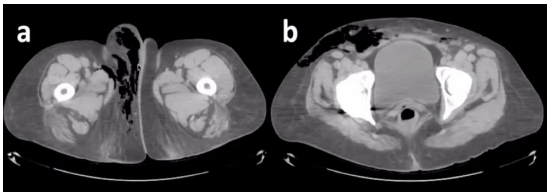
- Vital signs (will be tachycardic, hypotensive with the other signs of infection)
- Palpation of the genitalia and perineum and to DRE (digital rectal examination)
- Fluctuance, soft-tissue **crepitation**, localizing tenderness, or occult wounds
- ++ Creptus (gas on X-ray too) -palpable crepitation & gases on X-ray are diagnostic
- Skin overlying the affected region may be normal, erythematous, edematous, cyanotic and/or gangrenous

- Elderlies usually present late, because it is a private area, his son will bring him to the hospital because his father "feel unwell", and the one who will do the physical examination will discover the gangrene.
- And important aspect is that the progressing of the infection into gangrene is very fast, it may progress from stage and more advanced stage within hours while the patient wait in the emergency department.

Fournier gangrene

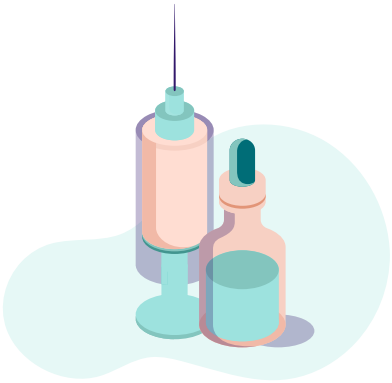
Investigations and markers:

- CBC (WBC, Hb)
- ABG (Septic, Acidosis)
- Urine and blood C/S (C/S means Culture)
- Swap and discharge C/S
- Imaging: **CT (with contrast) is the best modality** (to detect the underlying cause)



CT-Scan

- You can see here **gases in the subcutaneous tissue** and when you feel this area you would feel the crepitus.
- This picture mimic any another necrotizing gangrene
- The gas is indicator of "polymicrobial" infection that includes anaerobes, this indicates an urgent intervention because it is fastly spread into septicemia



Management:

- Aggressive **resuscitation** in anticipation of surgery. (IV fluid)
- Early, **broad-spectrum antibiotics** are indicated
- **Earlier surgical intervention** has been associated with reduced mortality

Surgical intervention:

- Examination under anesthesia
- Incision into the are of greatest clinical concern.
- If frankly gangrenous tissue is found or purulence is drained, the diagnosis of Fournier gangrene is established

- **Once a diagnosis of Fournier's gangrene is established, all necrotic tissue must be excised**
- (you need to remove "debri" everything that is infected, even if you reached the muscles or deeper, do the same each one or two days until you make sure you have removed everything, then do muscle and skin grafting)

Summary

Recall

Q1:What are the causes of decreased urine output?
Answer Hypovolemia, urinary retention, Foley catheter malfunction, cardiac failure, MI, acute tubular necrosis (ATN), ureteral/urethral injury, abdominal compartment syndrome, sepsis

Q2: How do you act initially in a case of decreased urine output?
Answer Examine, vital signs, check or place Foley catheter, irrigate Foley catheter, IV fluid bolus

Q3: A 77-year-old man s/p laparoscopic cholecystomy returns to the clinic with a palpable lower abdominal mass, confusion, and weak urine stream
Answer Urinary retention

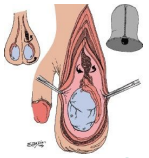
Q4: What are the causes of hematuria?
Answer Bladder cancer, trauma, UTI, cystitis from chemotherapy or radiation, stones, kidney lesion, BPH

Q5: What is the most common cause of severe gross hematuria without trauma or chemotherapy/radiation?
Answer Bladder cancer

Q6: What is testicular torsion?
Answer Torsion (twist) of the spermatic cord, resulting in venous outflow obstruction, and subsequent arterial occlusion → infarction of the testicl

Q6: What is the classic history of testicular torsion ?
Answer Acute onset of scrotal pain usually after vigorous activity or minor trauma

Q7: What is a “bell clapper” deformity?
Answer Bilateral nonattachment of the testicles by the gubernaculum to the scrotum (free like the clappers of a bell)



Q8: What are the signs?
Answer Very tender, swollen, elevated testicle; nonillumination; absence of cremasteric reflex

Q9: How is the diagnosis made?
Answer Surgical exploration, U/S (solid mass) and Doppler flow study

Q10: What is the treatment?
Answer Surgical detorsion and bilateral orchiopexy to the scrotum

Q11: How much time is available from the onset of symptoms to detorse the testicle?
Answer <6 hours will bring about the best results

Q12: What is Epididymitis ? What are the signs/symptoms?
Answer Infection of the epididymis, Swollen, tender testicle; dysuria; scrotal ache/pain; fever; chills; scrotal mass

Q13: What are the common bugs in the following types of patients:
Answer Elderly patients/children? Escherichia coli
Young men? STD bacteria: Gonorrhea, chlamydia

Q14: What is the workup?
Answer U/A, urine culture, swab if STD suspected, ± U/S with Doppler or nuclear study to rule out torsion

Q15: What is the treatment?
Answer: Antibiotics

Summary

Recall

Q16: What is the incidence of calculus diseases?
Answer: 1 in 10 people will have stones

Q17: What are the risk factors?
Answer: Poor fluid intake, IBD, hypercalcemia ("CHIMPANZEES"), renal tubular acidosis, small bowel bypass

Q18: What are the four types of stones?
Answer:1. Calcium oxalate/calcium PO 4(75%)—secondary to hypercalciuria (↑ intestinal absorption, ↓ renal reabsorption, ↑ bone reabsorption)
2. Struvite (MgAmPh) (15%)—infection stones; seen in UTI with urea-splitting bacteria (*Proteus*); may cause staghorn calculi; high urine pH
3. Uric acid (7%)—stones are radiolucent (Think: **U**ric = **U**nseen); seen in gout, Lesch–Nyhan, chronic diarrhea, cancer; low urine pH
4. Cystine (1%)—genetic predisposition

Q19: What type of stones is not seen on AXR? Uric acid (Think: Uric = Unseen)
What stone is associated with UTIs? Struvite stones (Think: Struvite = Sepsis
What stones are seen in IBD/bowel bypass? Calcium oxalate

Q20: What is the significance of hematuria and pyuria?
Answer:Stone with concomitant infection

Q21: What are the classic findings/symptoms?
Answer Flank pain, stone on AXR, hematuria

Q22: Diagnosis?
Answer KUB (90% radiopaque), IVP, urinalysis and culture, BUN/Cr, CBC

Q23: Treatment?
Answer Narcotics for pain, vigorous hydration, observation Further options: ESWL (lithotripsy), ureteroscopy, percutaneous lithotripsy, open surgery; metabolic workup for recurrence

Q24: What are the indications for intervention?
Answer Urinary tract obstruction Persistent infection, Impaired renal function.

Q25: What are the three common sites of obstruction?
Answer 1. UreteroPelvic Junction (UPJ) 2. UreteroVesicular junction (UVJ) 3. Intersection of the ureter and the iliac vessels

Q26: What is priapism?
Answer Persistent penile erection

Q27: What are its causes?
Answer Low flow: leukemia, drugs (e.g., prazosin), sickle-cell disease, erectile dysfunction treatment gone wrong High flow: pudendal artery fistula, usually from trauma

Q28: What is first line treatment?
Answer 1. Aspiration of blood from corporus cavernosum 2. α-Adrenergic agent

Non traumatic Urological Emergencies Summary

1-Hematuria

- The most important symptom that needs immediate medical help.
- **Cause vary according to** :
  - Age
  - Painful or painless.
  - Risk factors for malignancy like smoking
  - Types gross or microscopic.
  - Timing
  - Prsence of clot
- **Work up** :
  - History more important than PE
  - Physical examination (rectal examination).
- **Investigation**:
  - CT urography which is the gold standard.
  - You need also to to urine cultrue, urinalsis, electrolytes, urine cytology and CBC

2-Renal colics

- The most common urological emergency.
- Sudden, severe, colicy pain that radiates from flank down to the groin, scrotum & labia
- **Investigation**:
  - Helical CT withou contrast
  - Don't forget to exclude pregnancy
- **Treatment:**
  - Hydration
  - Pain relievers
  - Alpha blocker "for ureter stones only"
  - Schedule for follow-up 2 weeks later
  - Do surgery if one of the indications is present.

3a-Acute Urinary Retention

- Painful ***inability*** to void
- Caused mainly by BPH. In children main cause is constipation
- **Initial management**:
  - give the patient analgesic
  - urethral catheterization.
- **Late management** :
  - Treating the underlying cause.

3b-Chronic Urinary Retention

- pain is not a feature and many patient come to ER with renal failure or DM.
- **Symptoms**:
  - Urinary dribbling
  - Overflow incontinence
  - Palpable bladder with no pain.
- **Management: treatment** :
  - Renal support
  - Bladder drainage.
  - Late treatment of the underlying cause.

4-Acute Scrotum

- Most common causes are Torsion of spermatic cord & Epididymitis
- Torsion:
  - Teenagers (12-18
  - You have 4 hours to save testicles (
  - **Symptoms** include: acute onset of severe scrotal pain, referred to ipsilateral lower quadrant
  - In **examination** the testis is high riding & oriented in transverse direction., elevation of scrotum cause more pain. -ve Cremasteric reflex
  - If suspicious, don't delay the patient for investigation, treat immediately
  - **Investigation**: Color-doppler U/S is gold standard
  - **Treatment**: surgical exploration (contralateral testis must be examined also)
- Epididymo-Orchitis
  - Scrotal swelling with erythema
  - **Examinations**: Tenderness & +ve cremasteric reflex
  - **Urinalysis**: Pyuria or bacteuriaa
  - **Management**: Bed rest, scrotal elevation & Antibiotics.

5-Priapism

- Persistent erection of the penis more than 4 hours not related to sexual desire .
- **Cause**:
  - Primary: idiopathic 30-50% of the cases.
  - Secondary**:** drugs , trauma, neurological and hematological .
- **Types** :
  - Ischemic, painful is the most common.
  - Non ischemic painless.
- The diagnosis usually obvious from the history, duration of erection more than 4 hours.

Traumatic Urological Emergencies Summary

1-Renal Truama

- **Either Blund (road traffic accident), or Penetrating (gunshots)**
- **Radiological image** :
  - Contrast-enhanced CT is the study of choic
  - U/S is the alternative method
- **Management:**
  - Conservative, includes: wide Bore IV line, IV antibiotics, Bed rest , vital signs, serial CBC and HCT and follow up US and CT .
  - Surgical exploration (if the indications present).

2-Bladder Injuries

- **Causes** :
  - Iatrogenic injury: Due to surgery (cesarean delivery is the most common)
  - Penetrating trauma
  - Blunt pelvic trauma (Rapid deceleration injury.)
- **Types of perforation :**
  - intraperitoneal perforation. (Tx is open repair)
  - Extra-peritoneal perforation.(Tx is urine drainage)
- **Presentation**: classic triad of symptoms 1-suprapubic pain and tenderness 2-difficulty or inability to pass urine. 3-haematuria.

3- Ureteral Injuries

- Uncommon injury
- Either by external (needs severe force) or internal (hysterectomy)
- Usually diagnosed intraoperatively
- Treatment by surgery (mainly JJ stenting)

4- Anterior urethral Injuries

- Meatal bleeding, difficulty in passing urine, frank haematuria.
- **Diagnosis**
  - Diagnostic tool is retrograde urethrography.
- **Management:**
  - Contusion: small gauge Urethral catheter
  - Partial rupture: majority managed by suprapubic urinary diversion
  - Complete rupture:
    - unstable patient : use a suprapubic catheter
    - stable patient urethra may be immediate repaired or suprapubic catheter
  - Penetrating anterior urethral injuries are managed by surgical debridement and repair

5-Posterior Urethral Injuries

- **Mechanism**:
  - mostly are associated with pelvic fracture, 10-20% associated with bladder rupture.
- **Signs**: high riding prostate when Examining by digital rectal exam .
- **Management**:
  - type 1: stretch injury with intact urethra and stenting with a Urethral catheter.
  - Type 2 treatment with stenting a Urethral catheter.
  - Type 3 : initial management with suprapubic cystostomy and attempting primary repair at 7 to 10 days after injury.

Quiz

MCQ

Q1: Which of the following symptoms is characteristic for renal-caused hematuria ?

A) Initial bleeding with no clots
B) Total bleeding with clots
C) Terminal bleeding with no clots
D) Terminal bleeding with clots

Q2: 28 years old male presented with flank pain that radiates to the groin, you did as ultrasound and noticed acoustic shadow. What is the most proper diagnostic test to confirm the diagnosis of this patient ?

A) CT with contrast
B) Helical CT w/o contrast
C) KUB X-ray
D) IVU

Q3: 48-year-old female was a back seat passenger in a road traffic accident. You suspect renal trauma, what would be the most proper test to confirm the cass ?

A) CT with contrast
B) CT without contrast
C) IVU
D) Ultrasound

Q4: 88 year old man known to have DM & HT, his son brought him to the hospital because the father not feeling well, on physical examination you noticed some crepitations below the skin. What is the imaging of choice in this condition ?

E) CT with contrast
F) Helical CT w/o contrast
G) KUB X-ray
H) IVU

Q5: A 24 years old lady underwent hysterectomy, after 2 to 3 weeks she presented with abdominal distension, what would you suspect ?

A) Urethral Injury
B) Ureteral Injury
C) Bladder Injury

Answers

Q1	B	Q4	A
Q2	B	Q5	B
Q3	A	Q6	

Extra Questions

Good Luck!

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Feedback