



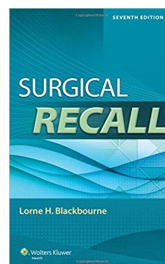
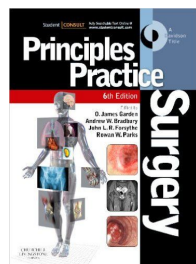
Emergency in urology

Objectives:

- Assessment of urinary tract symptoms & Hematuria.
- Examination & investigation of the urinary tract.
- Trauma of the upper & lower urinary tract.

Resources:

- Davidson.
- Slides.
- Surgical recall.
- Raslan's notes.



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[[Color index](#) | [Important](#) | [Notes](#) | [Extra](#)]

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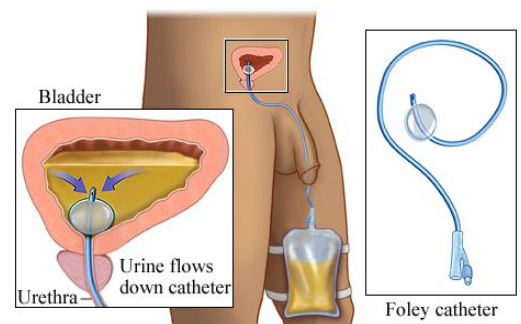
Once you stop learning
you start dying.

Urinary Catheters: “القسطرة البولية”

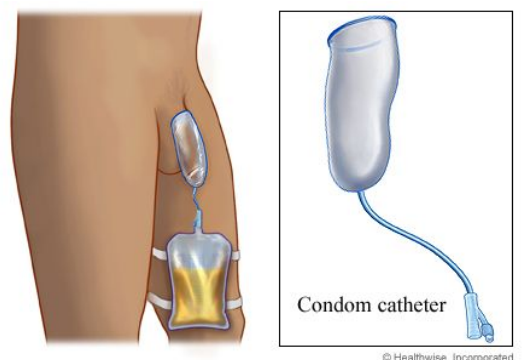
A hollow, partially flexible tube that collects urine. Can be used in case of urinary retention or incontinence. They come in many sizes and types.

- The three main types are:

- Indwelling catheters: often known as Foley catheter.
An indwelling catheter is a catheter that resides in the bladder; can be useful for short and long periods of time.
Urethral type: indwelling catheter inserted into the bladder through the urethra.
Suprapubic type: catheter is inserted into the bladder through a tiny hole in the abdomen above the pubic bone.
A tiny balloon at the end of the catheter is inflated with water to prevent the tube from sliding out of the body; This balloon needs to be then deflated when the catheter needs to be removed.



- External catheters (condom catheters):
A condom catheter is a catheter placed outside the body. It's typically necessary for men who don't have urinary retention problems but have serious functional or mental disabilities, such as dementia. A device that looks like a condom covers the penis head. A tube leads from the condom device to a drainage bag. These catheters are generally more comfortable and carry a lower risk of infection than indwelling catheters.



- Short-term catheters (intermittent catheters):
A person may only need a catheter for a short period of time after surgery until the bladder empties. After the bladder empties, it's necessary to remove the short-term catheter. Healthcare providers refer to this as an in-and-out catheter.



Introduction:

Compared to other surgical fields, there are relatively [few](#) Urological Emergencies, however, they require rapid diagnosis and immediate treatment.

HELP **EMERGENCY**

Urological emergencies are classified into:

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

Non-Traumatic Urological Emergencies

Hematuria¹

- **What are the types of hematuria?**

Gross (Macroscopic, Visible, Clinically visible)	Microscopic² (non visible, not clinical)
1 ml of blood in 1 liter of urine <u>visible for the patients</u> In up to 40%: malignancy	3 or more RBCs/High power, in 2 out of 3 properly collected samples (AUA). Here <u>the patient is told</u> that he has Hematuria.
Emergency or urgency	Not an emergency or urgency

- **Causes vary according to:**

1. Patient's **Age**

Most common cause of painless hematuria is transitional cell carcinoma of bladder, ureter, renal pelvis and calyx. however, it is not found in children, usually in middle-aged and older.

2. **Symptomatic or Asymptomatic:** Painful or painless changes your list of differentials.

Painful	Most common differential (top of the list): Renal stones, UTI, Trauma, Renal Vein thrombosis; and the last in your list will be malignancy.
Painless	The opposite, malignancy will be on the top of the list.

3. The existence of **risk factors** for malignancy

Malignancy risk factors: Smoking, middle age and work in specific factories.

4. The **type**: Gross or Microscopic

- Macroscopic or Gross: 20%-40% the risk of cancer.
- Microscopic: 3% or less the risk of cancer mostly benign problem.

¹ Blood in the urine البول الدموي.

² Less than 5% could be cancer.

- **Causes:**

Prerenal (Systemic)	Chemotherapy, SLE , radiation, liver diseases, malaria, hematological disease (e.g. sickle cell disease , thalassemia, hemophilia) or drugs e.g. anticoagulants (warfarin).
Renal (Kidney)	Renal calculi, renal vein thrombosis, pyelonephritis, renal tumors (benign or malignant), renal stasis , stone , TB , glomerulonephritis , renal trauma or nephritic syndrome.
Postrenal (Ureter, bladder, urethra and prostate)	Caused by obstruction of urinary tract downstream from the kidneys. Examples: urethral stricture , BPH , UTIs, schistosomiasis “ بيلهارسيا ”, trauma or tumor (bladder or ureter) e.g. transitional cell carcinoma of bladder, urethral polyp/tumor .

Transitional cell carcinoma.

- The most common cause of hematuria (other than trauma, radiation and chemotherapy).
- Its risk factors (Working in factories, smoking, petroleum workers and cyclophosphamide).
- Smoking is the risk factor number 1 in ksa for haematuria.
- It originates from the urothelium of the bladder.

What is the name of industrial carcinogens that can cause TCC?

- Aromatic amines.

- **Work up:**

- Gross Haematuria mandates full work up.
- **History.**
- P/E³ (Physical Examination) = usually there are not a lot of signs.

- **Investigations :**

- The single most important imaging method is **CTU (CT Urography)**.
- Insert 3 way foley catheter⁴ and bladder wash out for heavy bleeding.
- Treat according to the cause.



What is a CT Urogram used for?

Urography uses imaging and contrast material to evaluate or detect blood in urine, kidney or bladder stones, and cancer in the urinary tract. Urography with conventional x-ray is known as intravenous pyelogram (IVP). Urography is also often performed using computed tomography (CT) or magnetic resonance imaging (MRI)

³ No clinical significance other than causing anxiety to the patient.

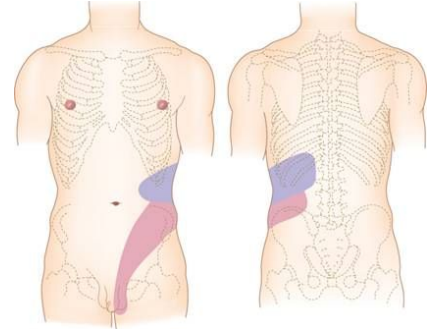
⁴ In the emergency if you have a patient with severe hematuria (severe bleeding) and it's very dark and you're afraid from clots it would be better to use this method.

● **History of Haematuria: important**

Age	Transitional cell carcinoma (TCC) is not common in children.
Residency	Endemic diseases like bilharziasis (schistosomiasis) which is common in some regions such as Jazan .
Duration	Amount of blood and for how long.
Occupation	Those who work in paint and tire factories have a high risk of TCC because aromatics material inhalation.
Pain Painless or Painful?	Each has different indications, also very important to ask what came first, pain or the hematuria? If pain came first → this indicates most likely stones. <ul style="list-style-type: none"> Stones, UTI, trauma, renal vein thrombosis are painful. If the hematuria appeared first → this indicates Malignancy <ul style="list-style-type: none"> Usually TCC originating from the urothelium of the bladder is painless. Risk factors for TCC: smoker, above 40, Lower urinary tract symptoms, irritation, radiation to the pelvis, bilharziasis.. etc. In tumors, clots become like stones; so it causes pain later on .
Timing	Help determining the site of bleeding. <ul style="list-style-type: none"> Total (persistence of blood in a whole urine) and midstream → at or above the level of bladder. Initial (blood at the beginning of urination then clear) → prostate, anterior urethra. Terminal (clear at the beginning of urination then blood) → bladder neck, trigone and posterior urethra.
How dark is urine?	To assess the severity.
Amount of bleeding, Clots and shape of clots	<ul style="list-style-type: none"> If straight lines (sausage like) → it passed through the ureter (by peristalsis movement) so the pathology is in the kidney (Renal cause). If rounded or other shapes → the pathology in the lower urinary tract.
Truama	Important in hematuria not only in acute stage but even in chronic stages because if the patient has severe kidney injury (contusion) then ischemia in the site of trauma after that clot lysis and becomes fistula and he might present with hematuria later <small>المغزى إن المريض ممكن يصير عنده ناسور بسبب صدمة و هو سبب الدم في البول</small>
Bleeding elsewhere	Per-rectum or gum or unusual epistaxis indicate it might be systemic.
Associated Symptoms	Urinary symptoms and other systemic symptoms.
Chronic History	Bleeding disorders like Sickle Cell anemia (common in saudi arabia), infections TB (usually renal TB associated with Hx of pulmonary TB), bilharziasis and stone disease.
Family History	Malignancy (prostate cancer is familial) or hematological disorders such as SC and thalassemia (sometimes the first presentation of hematological diseases is hematuria).
Drugs	<ul style="list-style-type: none"> Phenazopyridine (Urinary tract analgesic; causes red discoloration in urine). Rifampicin (TB antibiotic; causes orange discoloration in urine). Anticoagulants like warfarin (increases the tendency to bleed).
Colored food	Beetroot "الشمندر" and some colored candies or drinks.
Smoking	Why is it important? It is the risk factor number one for TCC in Saudi Arabia and renal tumors.

Renal Colic

- **The most common urological emergency** (in Saudi Arabia cases are seen daily)
- One of the most common differentials associated with **“Acute Abdomen”**
- **General risk factors include:** poor fluid intake, IBD, hypercalcemia, Renal tubular acidosis and bowel bypass.



- **History:**

- **Site:** flank pain, or groin pain (poor indicator of stone position)
- **Onset:** Sudden
- **Character:** Colicky (goes and comes) “مغص”
- **Radiation:**

- **Stone in kidney or upper ureter:** the pain may radiate to testes because they share the Same embryological origin and dermatome (T7-T9).
- **Stone in the middle ureter:** the pain may radiate to iliac fossa because they share the same dermatome (T10).
- **Stone in distal ureter:** shares the innervation of: dermatome (T12), trigone of bladder, posterior urethra so the pain might be in: suprapubic area, scrotum (skin), labia majora and/or lower abdomen.st

- **Associated with:** nausea/Vomiting (as well as other symptoms that are related to the specific etiology behind the pain, which we are going to know later on)
- **Timing:** Intermittent
- **Exacerbated by:** nothing; Relieved by: analgesia and movement (The patient can't get comfortable, and might be **rolling around**; moves to decrease the pain).
- **Severity:** so sever.
- **Ureteral stones:** Acute onset of severe, intermittent flank pain often associated with nausea and vomiting.

How to differentiate between right iliac fossa pain that is caused by acute appendicitis and right Mid ureteral colic pain? Those affected by acute appendicitis **can't move** due severe pain. While the pain of mid ureteral colic are **relieved** by movement so, the patients are gonna move continuously.

Recall:

What are the causes of hematuria?

Bladder cancer, trauma, UTI, cystitis from chemotherapy or radiation, **stones**, kidney lesions, BPH.

What is the most common cause of severe gross hematuria without trauma or chemotherapy/radiation?

Bladder cancer.

What are the symptoms (bladder cancer)?

Hematuria, with or without irritative symptoms (e.g., dysuria), frequency.

What is the classic presentation of bladder cancer?

Painless hematuria.

- **Differential diagnosis:**

- Acute appendicitis (patient doesn't move because if he moves the pain increases due to peritoneal irritation)
- Radiculitis (pseudo-renal) Exacerbated with movement or exertion and radiate to the lower limbs.
- Leaking (ruptured) abdominal aortic aneurysms
- Myocardial infarction or Pneumonia
- Ovarian pathology (e.g., twisted ovarian cyst) or Ectopic pregnancy
- Testicular torsion
- Inflammatory bowel disease (Crohn's, ulcerative colitis) or Bowel obstruction
- Diverticulitis
- Burst peptic ulcer
- Sickle cell, Porphyria Porphyria refers to a group of disorders that result from a buildup of natural chemicals that produce porphyrin in your body.

What is the radiculitis ?

Musculoskeletal pain due Inflammation or irritation of nerve root in the intervertebral foramen. A common subtype is sciatica (عرق النسا).

When does the radiculitis cause these symptoms in picture ?

Irritation of intercostals nerves (T7-T9) give these symptoms.

When does the radiculitis cause lower limb pain and how to differentiate it from renal colic ?

- Radiates to lower limb if involving sciatic nerve roots.
- Radiculitis is aggravated by movement and usually has lower limb pain "يكون فيه ألم" "في السجود والركوع"



Notes: in history of radiculitis, don't forget to ask about back pain and predisposed mobility (carrying something heavy); So usually aggravated by movement unlike stones that are relieved by movement.

- **Work Up:**

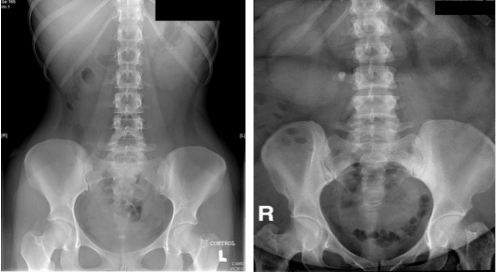
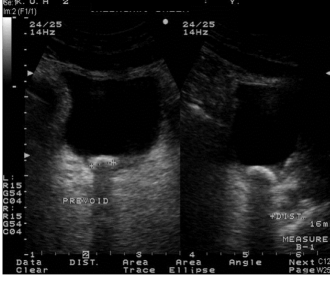
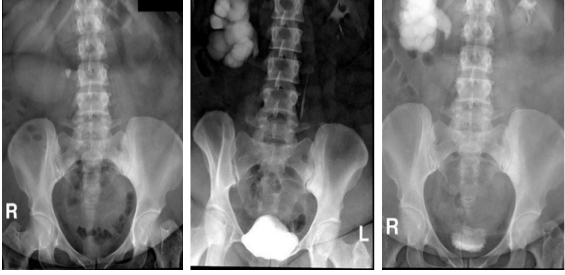
- History
- Examination: patient tends to move around, in an attempt to find a comfortable position. This helps in differentiating it from appendicitis where the patient can't move.
- +/- Fever indicates infection (e.g, pyelonephritis)


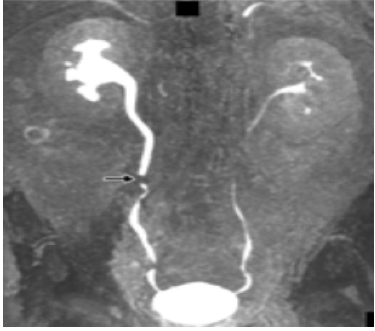
- **Investigation:**

- Pregnancy test to exclude ectopic pregnancy, and for radiological consideration (patient shouldn't be pregnant)
- MSU: Mid stream urine (presence of hematuria and make urine analysis)
- U&E (Urea and Electrolyte): to assess renal function "important" especially if both kidneys are affected; bilateral stones cause obstruction uremia lead to renal failure
- Urine analysis if found hematuria this confirm the pathology in urinary tract

A mid-stream urine sample means you don't collect the first or last part of urine that comes out. This reduces the risk of the sample being contaminated with bacteria from: your hands, the skin around the urethra, or the tube that carries urine out of the body.

● **Radiological investigation:**

KUB (kidney, ureter, bladder)	RUS (renal ultrasound)	IVU (intravenous urography)
		
<ul style="list-style-type: none"> ● plane abdominal X-ray ● determine the location ● The bone, Psoas and Kidney shadow, any opacity 	<ul style="list-style-type: none"> ● poor at locating stones (not reliable in choosing the management plan) ● Urine is black ● Hyperechogenic shadow is a stone 	<p>Getting less common, why?</p> <ul style="list-style-type: none"> ● takes time ● Needs contrast, which contains iodine that may cause rigidity and renal failure ● Needs bowel preparation

Helical CTU (Helical CT without contrast)	MRI
	
<ul style="list-style-type: none"> ● The gold standard ● Greater specificity (95%) and sensitivity (97%) for diagnosing ureteral stones ● 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 	<ul style="list-style-type: none"> ● Very accurate way of determining whether or not a stone is present in the ureters ● Time consuming ● Expensive <p>(for the previous two reasons we do not use them too often)</p> <ul style="list-style-type: none"> ● Suitable for pregnant ladies (No radiation)

- **Management:**

- **Medical Management:**

- Pain relief:
 - NSAIDs.
 - +/- Opiate analgesics (pethidine or morphine). may cause vomiting, So we give antiemetic
- Hyper hydration (IV fluids and drinking water)
- 5mm Stone or less: 'watchful waiting' with analgesic supplements; 95% of 5mm or less stones pass spontaneously.

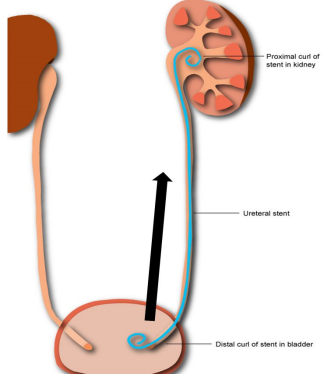
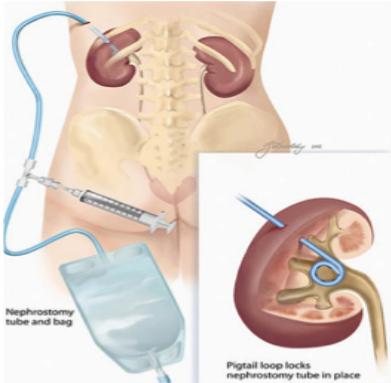
- **Surgical Management**

- Indications for Intervention: (و مثل أي حالة ما تلجأ للجراحة إلا في حالات معينة و هي كالآتي)
 1. To Relieve Obstruction and/or Remove the stone
 2. Pain that fails to respond to analgesics.
 3. Association with fever. (fever highly suggests pyelonephritis which requires drainage because it may cause septicemia).
 4. Renal function impairment caused by stone, which may cause uremia. And how do we assess renal functioning? = increase creatinine
 5. Obstruction unrelieved (not to exceed 4 weeks! because after 4 weeks the obstruction will cause necrosis) ممكن ننتظر الحصوة تنزل بنفسها لكن لو استمر الموضوع ل4 أسابيع لابد من تدخل جراحي
 6. Personal or occupational reasons: doctors or pilots

- **Types of Surgical intervention:** أنواع التدخلات الجراحية التي (تخفف) من حدة تأثير الانسداد

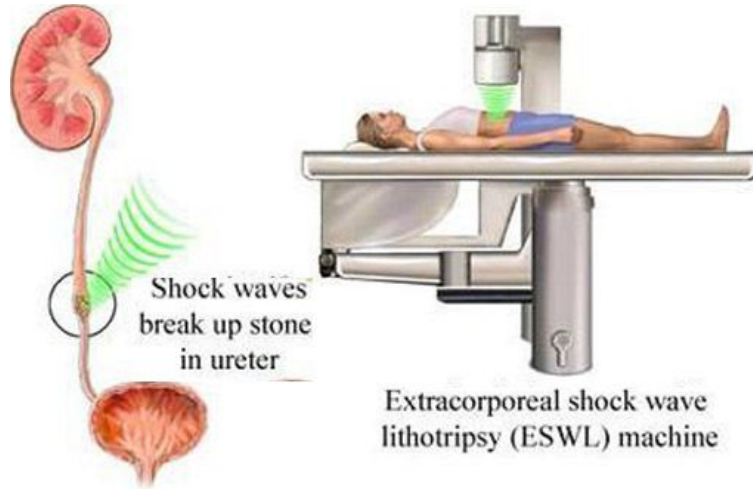
- **Temporary relief of the obstruction,**

because if the ureter is blocked for 4 weeks the kidney won't function normally so we need to intervene.

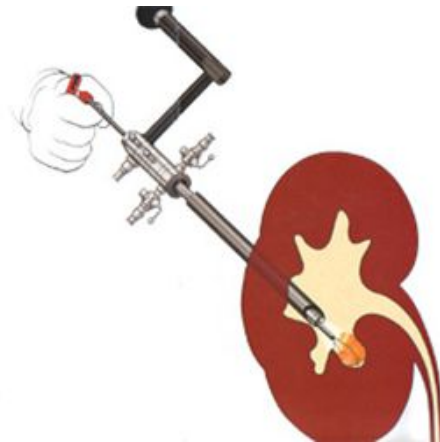
<p>Insertion of a double coil or JJ stent (stent means tubular support=دعامة)</p>	<p>ureteric stent, is a thin tube inserted into the ureter to prevent or treat obstruction of the urine flow from the kidney (coiling in renal pelvis and bladder), This method is sometimes used as a temporary measure, to prevent damage to a blocked kidney, until a procedure to remove the stone can be performed.</p>	
<p>percutaneous nephrostomy tube</p>	<p>A nephrostomy tube is a catheter (thin plastic tube) that is inserted through the skin and into your kidney. The nephrostomy tube drains urine from your kidney into a collecting bag outside your body. You may need one tube for each kidney.</p>	

- **Definitive treatment:** تدخلات جراحية (علاجية) أي بمعنى أنها تزيل أثر الحصوة بشكل كامل

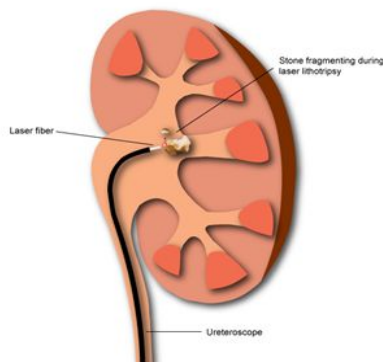
- **Extracorporeal Shock Waves Lithotripsy (ESWL)** uses shock waves to break a kidney stone into small pieces that can more easily travel through the urinary tract camera and pass from the body. used for Small radiopaque stones in kidney or upper ureter



- **Percutaneous Nephrolithotomy (PCNL or PNL)** is a minimally-invasive procedure to remove stones from the kidney by a small puncture wound (up to about 1 cm) through the skin. It is most suitable to remove stones of more than 2 cm in size and which are present near the pelvic region. used for large stones



- **Ureteroscopy (URS)** commonly known as laser is an examination of the upper urinary tract, usually performed with a ureteroscope that is passed through the urethra and the bladder, and then directly into the ureter; usually the lower 2/3 of the ureter is accessible by this procedure. very common



- **Laparoscopic extraction** (*rare*) استخراج بواسطة المنظار **if combined with other pathology**
- **Open Surgery:** for those who do not know what open surgery means, once you hear surgery word what comes to your mind? Exactly you imagine surgeons cutting the patient open and doing whatever suitable for his case this is the meaning of open surgery (you literally open the patient) unlike the previous minimal surgical procedures where we insert scopes, use waves or small instrument that doesn't really need opening the patient and causing large scares. (very limited)

Urinary Retention

- **Acute Urinary retention:** المريض يجي يصيح في الطوارئ

Painful **inability** to void, with relief of pain following drainage of the bladder by catheterization.

More common in Men than in Women

- **Causes:**

Men	Women (rare)
<ul style="list-style-type: none"> → Benign prostatic enlargement (BPE) due to BPH is the most common cause (usually in >40 years of age) → Carcinoma of the prostate → Prostatic abscess → Urethral stricture → Stones → Constipation 	<ul style="list-style-type: none"> → Pelvic prolapse (cystocele, rectocele, uterine) → pelvic masses (e.g., ovarian masses) → Urethral stenosis → Urethral diverticulum or stricture → Post surgery for 'stress' incontinence → Transvaginal tape (sling) in those with stress incontinence (لو كان مشدود أكثر من اللازم) is very common.

Management: to relieve the pain

1. Give the patient analgesic to prevent spasm
 2. Urethral catheterization if you can't enter it (stricture in urethra), use the Suprapubic catheter (SPC) which passes directly to the bladder through skin
- **Late Management** *definitive treatment:*
Treating the underlying cause

- **Chronic Urinary Retention:**

- Obstruction develops slowly, the bladder is distended (stretched) very gradually over weeks/months, **It is usually associated with Reduced renal function, Upper tract dilatation (hydronephrosis) and remember Pain is not a feature.**

Note: many patient with chronic retention present to ER with renal failure.

- **Usually associated with:**

- Reduced renal function.
- Upper tract dilatation and hydronephrosis

- **Presentation:**

- Urinary dribbling
- Overflow incontinence common when vesical pressure exceeds sphincter pressure
- Palpable Bladder with no pain
- Symptoms of renal failure
- Pyelonephritis and even renal failure

- **Management:**

In general it is more difficult than acute retention because the cause is usually neurological

- Treatment is directed to **renal support** and treat electrolyte imbalance
- Bladder drainage in a slow rate to avoid sudden decompression (can cause Hematuria)
- Treatment of underlying cause.

Acute Scrotum⁵

Emergency situation requiring prompt evaluation, differential diagnosis, and potentially immediate surgical exploration

- **Differential Diagnosis:**

- **Torsion of the spermatic cord (Most serious) most important**
- Torsion of the appendix testis
- Torsion of the appendix epididymis
- Epididymitis (**Most common**)
- Epididymo-orchitis **important**
- Orchitis
- Inguinal hernia
- Trauma/ insect bite
- Dermatological lesion
- Inflammatory vasculitis (Henoch-Schonlein purpura)
- Neurological (adductor tendonitis)
- Communicating hydrocele
- Hydrocele
- Idiopathic scrotal edema
- Tumor
- Spermatocele
- Non-urogenital pathology e.g. adductor tendinitis

⁵ Also known as scrotal pain or testicular pain

- **Torsion of the Spermatic cord:** Most serious

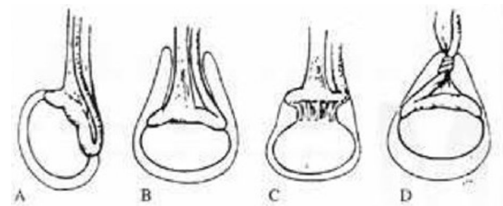
- **General consideration:**

- Common among teenagers (12-18) years (always think of torsion until proven otherwise)
- Possible in children and neonates
- Unlikely after the age of 25 years
- **True surgical emergency of the highest order**
- Irreversible ischemic injury to the testicular parenchyma may begin as soon as 4 hours
As duration of torsion increases the possibility of testicular salvage Decreases.
- The twisting will lead to occlusion of venous return → swelling and blockage of arterial supply.
- The longer the time of torsion → more ischemia

What is the classic history? Acute onset of scrotal pain usually after vigorous activity or minor trauma

- **Anatomical variations:**

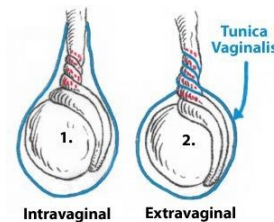
- Normal
- Bell clapper deformity: tunica vaginalis surrounds the whole testicle so it is very loose.
- Loose epididymal attachment to the testis
- Torsed testis with horizontal lie



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

- **Types of torsion:**

- Extra-vaginal (tunica vaginalis is involved)
- Intra-vaginal



- **Presentation:**

- Acute onset of scrotal pain. Sharp and severe and may be intermittent due to torsion and detorsion
- Majority with history of prior episodes of severe, self-limited scrotal pain and swelling
- Nausea/Vomiting due to pain
- Referred to the ipsilateral lower quadrant of the abdomen.
- Children may present with abdominal pain and might not complain of testicular pain
Any child comes with nausea and vomiting or complains of severe abdominal pain needs to have genital examination.
Doctor mentioned a scenario: a mother brought her child to the clinic and said "my son went to school and ate bad food and now he has abdominal pain and nausea/vomiting" after further inspection the child had Torsion of the cord.
- Dysuria and other bladder symptoms are usually absent (unlike Epididymitis)

- **Physical examination:**

- The affected testis is high and lying transverse
- Acute swelling and scrotal edema or secondary hydrocele
- **Absent Cremasteric reflex.** because the nerve is within the spermatic cord
- Testis is tender and larger than other side the patient will not let you touch it
- **Elevation** of the scrotum causes **more** pain (**negative Prehn's sign**)

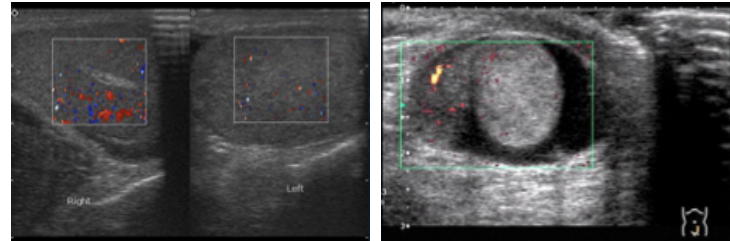
- **investigations:**

- this is an **emergency case**, with a high degree of suspicion is enough to **send the patient to the OR immediately** "ما نجلس ناخر المريض عشان فحوصات"

- **Adjunctive tests:** نستخدمها عادةً لما نكون متأكدين إنه شيء غير التورشن

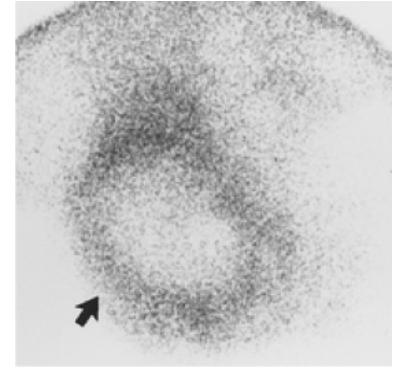
- To aid in differential diagnosis of the acute scrotum.
- To confirm the **absence** of torsion of the cord.
- Tests used:
 - **Sound Doppler** examination of the cord and testis: High false-positive and false-negatives
 - **Color Doppler ultrasound:**

- **Investigation of choice**
- **Done in OR**
- Assessment of anatomy and determining the presence or absence of blood flow^{6, 7}
- Sensitivity: 88.9% specificity of 98.8%
- Operator dependent.



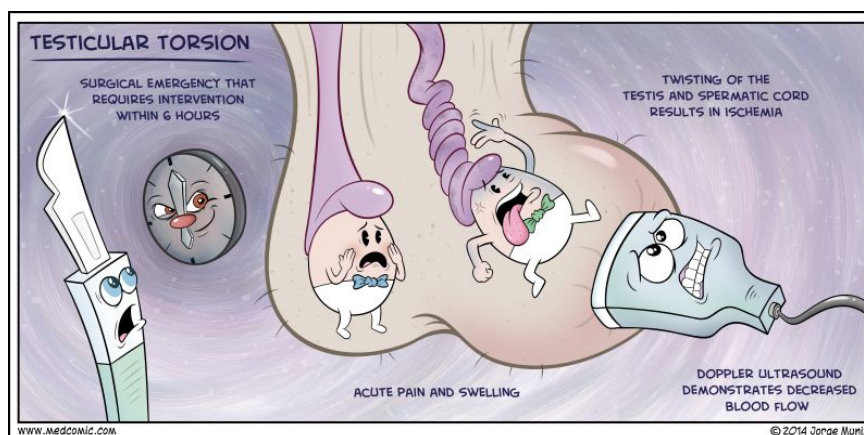
- **Radionuclide imaging:**

- Assessment of **testicular blood flow**.
- Shows a photopenic area in cases of torsion
- A sensitivity of 90%, and specificity of 89%.
- False impression from hyperemia of scrotal wall.
- Not helpful to determine a Hydrocele or Hematoma (does not assess anatomy)



- **Surgical exploration:**

- **Diagnostic and therapeutic**
- A scrotal incision is done and the affected site should be examined first: **a needle prick is done and if there is no blood coming out or black tissue it means it is dead**
- The cord should be **detorsed**.
- 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



⁶ To see the arterial blood supply of the testis

⁷ In the pictures: in the left there is absence of blood supply, secondary hydrocele without arterial flow

Surgical Recall :

What is it Testicular torsion?

Torsion (twist) of the spermatic cord, resulting in venous outflow obstruction, and subsequent arterial occlusion >> infarction of the testicle

What is the classic history?

Acute onset of scrotal pain usually after vigorous activity or minor trauma

What is a "bell clapper" deformity?

Bilateral non attachment of the testicles by the gubernaculum to the scrotum (free like the clappers of a bell)

What are the symptoms? Pain in the scrotum, suprapubic pain

What are the signs? Very tender, swollen, elevated testicle; non illumination; absence of cremasteric reflex.

What is the differential diagnosis?

Testicular trauma, inguinal hernia, epididymitis, appendage torsion

How is the diagnosis made?

Surgical exploration, U/S (solid mass) and Doppler flow study, cold Tc-99m scan (nuclear study)

What is the treatment?

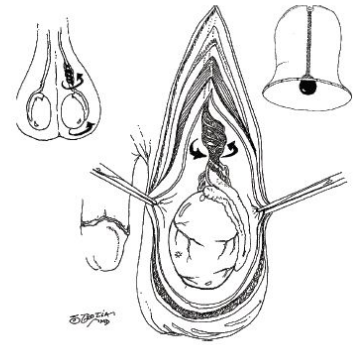
Surgical detorsion and bilateral orchiopexy to the scrotum.

How much time is available from the onset of symptoms to detorse the testicle?

< 6 hours will bring about the best results; >90% salvage rate.

What are the chances of testicular salvage after 24 hours?

10%.



● Epididymo-orchitis

- In children rare but usually due to viruses like mumps, coxsackie & brucella (common in KSA & all ages)
- In middle age due to STDs (Gonorrhea, Chlamydia)
- In older age secondary to UTI or prostatic causes (BPH)

● Presentation:

- Common in KSA (can be manifestation of brucella)
- Indolent process causing little or no pain
- Scrotal swelling, erythema, and pain
- Usually gradual and not sudden.
- Dysuria and fever is more common in patients with history of STD like gonorrhea or UTI

● Physical examination (P/E) :

- Localized swollen and tender epididymis, or a massively swollen hemiscrotum with absence of landmarks.
- Cremasteric reflex should be **present**
- **Positive Prehn's sign indicates there is pain relief with lifting the affected testicle**

● Urinalysis: pyuria, bacteriuria and/or a positive urine culture and WBC

● Management:

- Bed rest for 1 to 3 days then relative restriction
- Scrotal elevation, the use of an athletic supporter >
- Parenteral or oral antibiotic therapy should be instituted when UTI is documented or suspected.
- Urethral instrumentation should be **avoided** during acute stage because may cause septicemia and septic shock



Priapism

- Persistent erection of the penis for **more than 4 hours** that is NOT related or accompanied by sexual desire. The persistence of Priapism will cause clotting which leads to healing by fibrosis in the corpora and this will damage it and the patient will lose the ability of erection (impotent), associated with intracavernosal self-injection for impotence (the most common cause)

- **Causes:**

- Primary (Idiopathic) : 30% - 50% of the cases
- Secondary: Drugs Trauma, Neurological, Hematological disease like SC, And pelvic malignancies.

- **Types:**

Ischemic (most common)	Nonischemic
(veno-occlusive, low flow) (worse)	(arterial, high flow)
Pathophysiology: thrombosis of the venous system causing congestion and engorgement which leads to the erection	Pathophysiology: perineal trauma will cause an arteriovenous fistula which fills the corpora
Due to hematological disease e.g. Sickle cell trait, Leukemia, malignant infiltration of the corpora cavernosa with malignant disease, pelvic Tumor, or drugs such as (prostaglandin injection; prazosin)	Due to perineal trauma, which creates an arteriovenous fistula. (pudendal artery fistula)
Painful	Painless

- **The diagnosis:** Usually obvious from the history

- Duration of erection
- Is it painful or not?.
- Previous history and treatment of priapism ?
- Identify any predisposing factors and underlying cause

- **Examination:**

- Erect, tender penis (in low- flow) or not.
- Characteristically the corpora cavernosa are **rigid** and the glans is **flaccid**.
- Abdominal examination for evidence of malignant disease
- Digital rectal exam (DRE): to examine the prostate and check anal tone. (neurological assessment)

- **Investigation:**

- CBC (white cell count and differential, reticulocyte count) (Leukemia)
- Hemoglobin electrophoresis for sickle cell disease.
- Urinalysis including urine toxicology.
- **Blood gases** taken from either corpora:

	Low flow (ischemic/occlusive)	High flow (non ischemic/ fistula)
Blood color	dark blood	bright red blood similar to arterial blood at room temperature
PH	<7.25 (acidosis)	= 7.4 (normal)
PO ₂	pO ₂ <30 mmHg (hypoxia)	pO ₂ >90 mmHg (normal)
PCO ₂	pCO ₂ >60 mmHg (hypercapnia)	pCO ₂ <40 mmHg (normal)

- Color flow duplex ultrasonography in cavernosal arteries:
 - o **Ischemic** (inflow is low or nonexistent)
 - o **Non-ischemic** (inflow is normal to high).
- **Penile pudendal arteriography** in cases of trauma
- **Treatment:**
 - Depends on the type of priapism.
 - Conservative treatment should first be tried; ask the patient to climb the stairs to open venous channels.
 - Medical treatment: **alpha-Adrenergic Agent, bicarbonate, high o₂, cold enema, hydration and IV fluid**
 - Surgical treatment: **Aspiration and saline wash of the corpora then shunt**
 - Treatment of underlying cause

Recall :

What is priapism?

Persistent penile erection.

What are its causes?

Low flow: leukemia, drugs (e.g., prazosin), sickle-cell disease, erectile dysfunction treatment gone wrong

High flow: pudendal artery fistula, usually from trauma

What is the first-line treatment?

1. Aspiration of blood from corpus cavernosum
2. α - Adrenergic agent

Traumatic Urological Emergencies

Renal Trauma⁸

- The kidneys relatively protected from traumatic injuries so a considerable degree of force is usually required to injure a kidney.

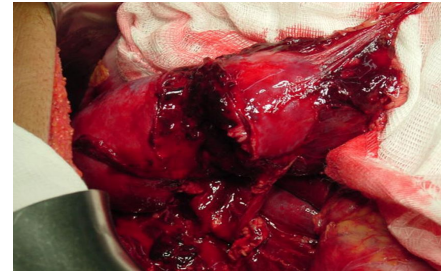
- **Mechanism and causes:**

- **Blunt trauma:**

- Direct blow "ضربة مباشرة" or acceleration/ deceleration injuries.
- Road traffic accidents, falls from a height, fall on flank **very common in KSA**

- **Penetrating trauma:**

- Knives, gunshots, **iatrogenic**⁹ e.g., percutaneous nephrolithotomy (PCNL)
- **Most cases of penetrating mechanism in Saudi Arabia are due to surgery (iatrogenic)**



- **Renal imaging¹⁰:**

- **Indications for renal imaging**

- Penetrating chest, flank, and abdominal wounds (**any injury close to the kidney**)
- A history of a rapid **acceleration** or **deceleration** (**fall from height or road traffic accidents**)
- **Macroscopic haematuria** (**is an indication of immediate imaging process**)
- **Microscopic** [**>5 red blood cells (RBCs)** per high powered field] or dipstick.
- Hematuria in hypotensive patient (SBP <90 mmHg) (**you give him a lot of fluid and no response**)
- Any child with microscopic or dipstick haematuria who has sustained trauma, even <5 RBC.

- **Available Modalities:**

IVU	<ul style="list-style-type: none"> - Replaced by the contrast enhanced CT. ما صاروا يستخدموها كثير هالأيام فاستبدلواها. - the only indication of IVU is intraoperative without having a CT scan in case of retroperitoneal hematoma to look for renal injury - Done to see if other kidney is functioning and/or exists because the injured kidney might have to be removed. في الغالب إحنا حنشل الكلية المتأثرة فحتاج نتأكد إن الثانية سليمة و. تشتغل كويس
CT scan	<ul style="list-style-type: none"> - Spiral non contrast: does not allow accurate staging. Good only with stones - With contrast (CT urography OR CT of abdomen OR CT angio): <ul style="list-style-type: none"> - imaging study of choice: accurate, rapid, can assess other abdominal injuries and structures

⁸ Usually renal injury leads to retroperitoneal hematoma. *Retroperitoneal hematoma: refers to an accumulation of blood found in the retroperitoneal space.*

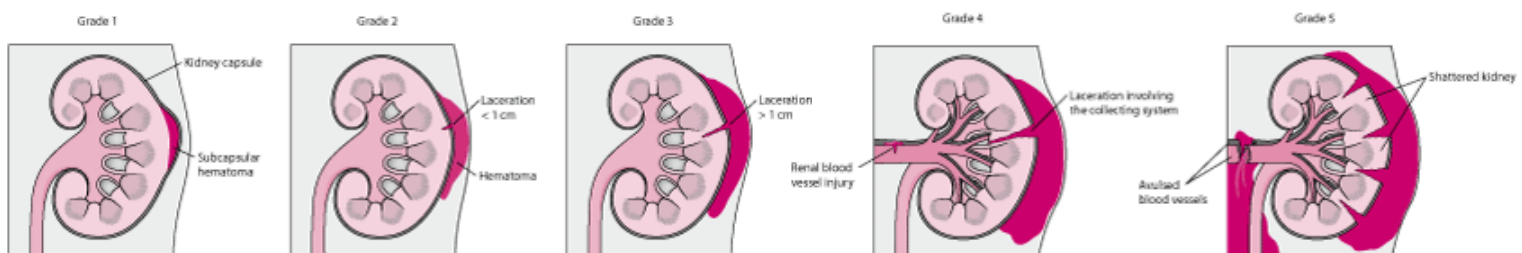
⁹ During operations

¹⁰ Modality of choice is contrast enhanced CT.

Renal US	<ul style="list-style-type: none"> - Advantages: (mainly to follow up after CT) <ul style="list-style-type: none"> – 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: <ul style="list-style-type: none"> – 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.
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- **Grades and Stages¹¹:** done by CT with contrast

I	Flank pain + Hematuria with or without pericapsular Hematoma, but no evident kidney damage, So Only perinephric (subcapsular) hematoma without kidney tearing.
II	Injury to the cortex (tearing) with hematoma only of 1cm or less.
III	Injury to the cortex and medulla without reaching the collecting system with hematoma more than 1cm.
IV	Injury reaching the collecting system OR thrombosis to the renal vessels. - On IVU there will be extravasations of contrast and decreased filling.
V	Bleedily shattered kidney completely or avulsion of renal pedicle



- **Management:**

- **Those who are Conservatively treated:** (without surgical intervention)

- Over 95% of blunt injuries
- 50% of renal stab injuries and 25% of renal gunshot wounds With the help of CT scan (needs a specialized center). في هذي الحالة الوحيدة الي يشوف فيها ميزة للسمين لأن طبقات الدهون تحمي الكلى.

- Conservative treatment Include:

1. **Wide Bore IV** line to transfuse fluids.(big cannula) e.g. Blood transfusion
2. **IV antibiotics.** Because hematoma may cause an infection (it's a good media for growth)
3. **Bed rest** because if he moves the clot will dislodge and he will bleed more so we advise them to rest especially during the first 3 days
4. **Vital signs** monitoring.
5. Serial **CBC** and **HCT¹²** to see if there is a bleeding or there is not, and HCT to see if there is a serious dropping in Hb
6. Follow up **US** &/or **CT**.

- **Surgical exploration:** indications for surgery

- We try as much as we can not to interfere surgically, because most likely we'll need to remove the whole kidney to stop the bleeding.

¹¹ Most of cases of massive renal injury lead to removal of other kidney.

¹² Hematocrit

- **Persistent bleeding** (persistent tachycardia and/or hypotension failing to respond to appropriate fluid and blood replacement) **in case there are signs of shock better to go and explore**
- **retroperitoneal hematoma**¹³ still held by peritoneum so it's better **not to interfere**

So when do we interfere?! In these 2 conditions:

- **Expanding perirenal hematoma** after laparotomy (**interfere**) **this is a sign of massive bleeding**
- **Pulsatile perirenal hematoma**¹⁴ after laparotomy. (**interfere**)

Ureteral Injuries

The ureters are protected from external trauma by surrounding bony structures (vertebral column), muscles and other organs therefore injury is rare.

● Mechanism and causes:

External trauma (rare)	Internal trauma (iatrogenic)
<ul style="list-style-type: none"> - Severe force is required. - Blunt or penetrating: <ol style="list-style-type: none"> 1. Blunt external trauma severe enough to injure the ureters will usually be associated with multiple other injuries 2. Penetrating knives or bullets to the abdomen or chest may damage the ureter, as well as other organs. 	<ul style="list-style-type: none"> - Uncommon, but is <u>more common than external trauma</u>. <u>Although they said it's uncommon, I see it common.</u> - Iatrogenic: (Ob/Gyn surgery is the most common): <ol style="list-style-type: none"> 1. Hysterectomy, oophorectomy, and sigmoid colectomy 2. Caesarean section Gynae 3. Ureteroscopy 4. Aortoiliac vascular graft replacement 5. Laparoscopies very rare nowadays, modalities used are better 6. Orthopedic operations

● Diagnosis:

- Requires a high index of **suspicion**, usually diagnosed **Intra-operatively** (by drainage).
When there's a surgery close to the ureters we advise surgeons to use a stent if it didn't help the ureter from injury it will help in the identification of injury
- Late diagnosis: (**suggestive of ureteral injury**)
 1. An ileus: the presence of urine within the peritoneal cavity
 2. Prolonged postoperative **fever** or overt urinary **sepsis**
 3. Persistent drainage of fluid (urine **w/ high Creatinine**) from abdominal or pelvic drains, from the abdominal wound, or from the vagina.
 4. Flank pain if the ureteral artery has been ligated (**after surgery; we need to do radiology**)
 5. An abdominal mass, representing a urinoma (urinoma: A urinoma is a mass formed by encapsulated extravasated urine. It may follow closed renal injury, surgical operation or arise spontaneously in the presence of obstruction)
 6. Vague abdominal pain (make us suspicious)

¹³ *Retroperitoneal hematoma: refers to an accumulation of blood found in the retroperitoneal space.*

¹⁴ Note : Expanding hematoma quickly and pulsatile hematoma indicate large blood vessels injury which require surgical intervention

● Treatment options:

- JJ stenting If it was a **partial tear** (we put a stent and leave it 4 weeks to heal itself).
- Primary closure of partial transection of the ureter.
- Direct ureter to ureter anastomosis.
- **Re-implantation of the ureter into the bladder using a psoas hitch¹⁵ or a Boari flap¹⁶ (most used).** if it is long (we do it directly) ,but if ureter is short we use psoas hitch.
- Trans uretero-ureterostomy. ناخذ اليوريتير المقطوع و نوصله باليوريتير السليم
- Auto-transplantation of the kidney into the pelvis. يعني ينزل الكلى للحوض عشان يقصر المسافة.
- Replacement of the ureter with ileum.
- Permanent cutaneous ureterostomy.
- Nephrectomy. زمان مع قلة الخبرة كانوا يشيلوا اليوريتير المقطوع بكبره و ياخذوا الكلية إذا كانت سليمة و هذا خيار سيء بلا شك، ذكر الدكتور إنه كانت عندهم حالة الحالب كان مصاب بشكل كبير و كل ما حاولوا إصلاحه بفشل فأحد الأطباء المقيمين قال (: نشيل الكلية و نبيعها

Bladder Injuries ¹⁷

● Causes:

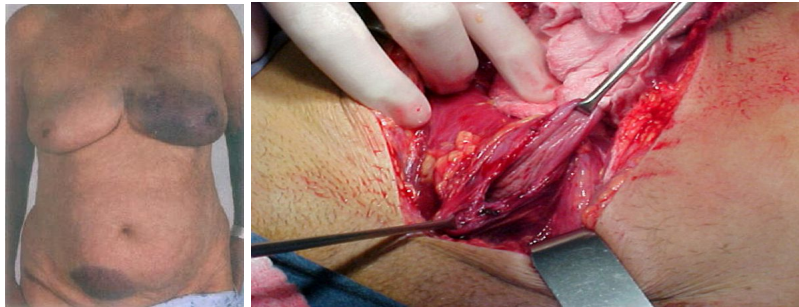
- **Iatrogenic injury:** of or relating to illness caused by medical examination or treatment like the following
 1. **Transurethral resection of bladder tumor (TURBT):** is a procedure in which bladder tumors can be removed from the bladder wall. This is a procedure performed completely with a scope that is inserted through the urethra into the bladder
 2. **Cystoscopic bladder biopsy:** A bladder biopsy can be done as part of a cystoscopy. Cystoscopy is a telescopic examination of the inside of the bladder. A small piece of tissue or the entire abnormal area is removed, The tissue is sent to the lab to be tested.
 3. **Transurethral resection of prostate (TURP):** is a surgery used to treat urinary problems due to an enlarged prostate. A combined visual and surgical instrument (resectoscope) is inserted through the tip of the penis and into urethra.
 4. **Cystolitholapaxy:** is a procedure to break up bladder stones into smaller pieces and remove them
 5. **Caesarean section, especially as an emergency (most common)**
 6. **Total hip replacement (very rare)**

¹⁵ The psoas hitch is a useful technique for bridging a defect involving the lower third of the ureter, With the psoas hitch, the bladder is pulled up and secured to the psoas muscle, to reduce the distance between the distal ureter and the bladder.



¹⁶ A Boari bladder flap is one of the options for ureteral reimplantation when the diseased ureteric segment is long (e.g. more than 5 cm). It is useful in the management of lower ureteric strictures and can be performed as either an open or laparoscopic procedure. It involves tubularization of a flap of bladder to extend from the bladder to the ureteral orifice.

¹⁷ the good thing about bladder most of the time it's a forgivable organ you injure it and suture it and leave a catheter until it heals

- **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
- **Spontaneous rupture after bladder augmentation**¹⁸ we can augment the bladder with the intestine patch (نرقعها)



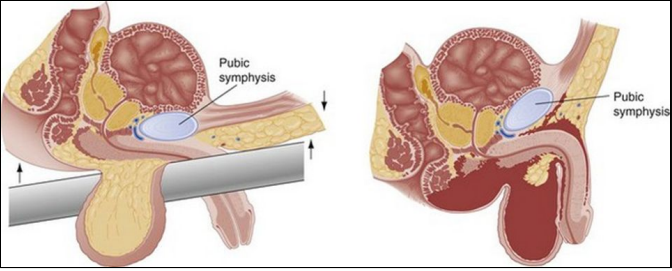
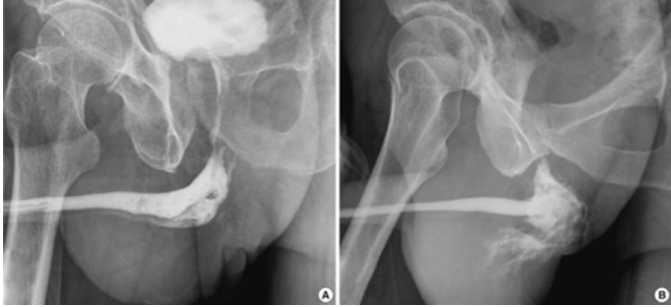

● **Types of perforation:** (mostly extra-peritoneal)

Intraperitoneal perforation	Extra-peritoneal perforation
<p>The peritoneum overlying the bladder, has been breached along with the wall the of the bladder, allowing urine to escape <u>into the peritoneal cavity</u>.</p> 	<p>The peritoneum is intact and urine escapes into the space around the bladder, but <u>not</u> into the peritoneal cavity. (more common)</p> 
Presentation	
<p>- Recognized intraoperatively يعني داخل الجراحة</p> <ul style="list-style-type: none"> - The classic triad of symptoms and signs that are suggestive of a bladder rupture: <ol style="list-style-type: none"> 1. Suprapubic pain and tenderness 2. Difficulty or inability in passing urine 3. Haematuria 	
Mangement	
<ul style="list-style-type: none"> ● Intraperitoneal : By open repair, why? ليش نحتاج نفتح المريض <ul style="list-style-type: none"> - Usually large - Unlikely to heal spontaneously. - Leakage causes peritonitis - Other organs are usually injured. 	<ul style="list-style-type: none"> ● Extraperitoneal: u don't need anything except foley actor catheter for 1week or 10days <ul style="list-style-type: none"> - Bladder drainage. (by foley catheter) +++++ - Open repair (surgery) is rare but only If the injury persistence +

¹⁸ Bladder augmentation is an operation to make the bladder larger. It can also lower the pressure in the bladder and make it more elastic.

Urethral Injury

- Anterior urethra is external structure to pelvic brim while the rest parts of urethra are posterior.
- In male posterior urethra involves membranous and prostatic urethra while anterior only penile urethra.
- Anterior urethra → what you see from glans to pelvic brim; posterior urethra → what you can't see: membranous and prostatic

Anterior injury (rare)	Posterior injury
<p>Mechanism:</p> <ul style="list-style-type: none"> - Majority are a result of straddle injury in boys or men. (jumping while your legs are open) - Direct injuries to the penis. - Penile fractures. - Inflating a catheter balloon in the anterior urethra (before enter the bladder). بعض أطباء الإمتياز مع التوتر و الخوف يدخل الكاثيتر شوي و يتوقف ما يكمل للمثانة فدخلوا الكاثيتر كامل لا تفتحوا البالون في اليثرثا - Penetrating injuries by knives or guns 	<ul style="list-style-type: none"> - Mostly are associated with pelvic fractures. RTA (because the pelvic fractures affect the membranous urethra حوادث السيارات - 10% to 20% <u>have an association with bladder rupture.</u> 
Signs and symptoms	
<ul style="list-style-type: none"> - Blood at the end of penis. Meatal Bleeding Meatal from external meatus - Difficulty in passing urine. - Frank haematuria if it's very massive - Hematoma may accumulate around the site of the rupture. - Swelling of the penis. 	<ul style="list-style-type: none"> - Blood at the meatus, gross hematuria, and perineal or scrotal bruising. - High-riding prostate when examining by digital rectal exam (which means can't feel the prostate when doing rectal examination and this is because of the hematoma it pushes the prostate up).
Diagnosis of Anterior urethral injury	
<ul style="list-style-type: none"> - The diagnostic tool is Retrograde Urethrography¹⁹ (ascending urethrogram): <ul style="list-style-type: none"> • Less filling means greater damage <ul style="list-style-type: none"> ○ Contusion كدمة: <u>no extravasations</u> of fluid ○ Partial rupture: <u>extravasations of contrast</u> with contrast present in the bladder ○ Complete disruption: <u>no filling</u> of the posterior urethra or bladder 	

¹⁹ Retrograde urethrogram: contrast is injected through the urethra using a catheter and images are taken.

Management

Anterior injury (rare)

1. **Contusion:** إذا تأكدنا انها تمام ومافي الا كدمة
 - Do nothing
 - Small-gauge urethral catheter for one week
 2. **Partial Rupture of Anterior Urethra:**

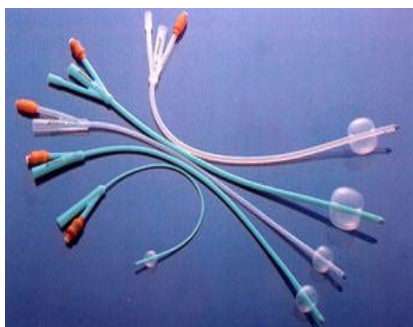
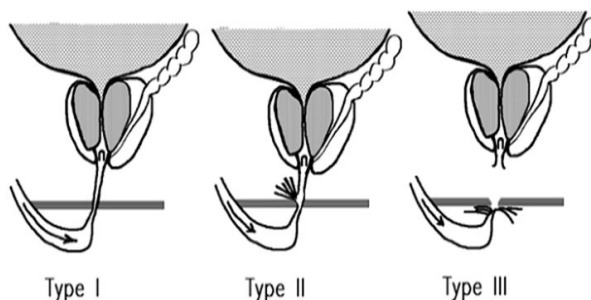
انتبه تتقلسف في البارشال ريتشر! اذا ماعندك معدات لا تدخل الكاثيتر على عمى!!! ممكن تحوله لكومبليت

 - **No blind insertion of urethral catheterization** (now we use Portable Flexible Scopes in ER). (may be by using cystoscopy and guide wire)
 - Majority can be managed by **suprapubic urinary diversion** for one week
 - Penetrating partial disruption (e.g., knife, gunshot wound), primary (immediate) repair.
 3. **Complete Rupture of Anterior Urethra**
 - Unstable patient: use a suprapubic catheter.
 - Stable patient: the urethra may either be immediately repaired or a suprapubic catheter is placed
- **Penetrating Anterior Urethral Injuries** are generally managed by surgical debridement and repair

Posterior injury

Classification of posterior urethral injuries:

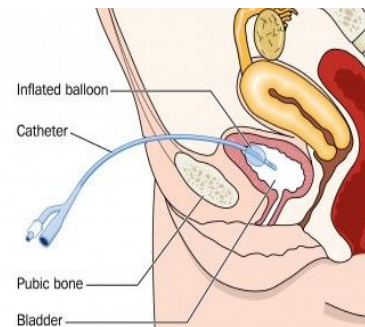
- **Type I:**(rare) يعني سليمة بس زايد طولها
 - **stretch injury with intact urethra**
 - Treatment : Stenting with a urethral catheter.** دعامات Like what we did in contusion
- **Type II :** (25%)
 - partial tear but some continuity remains
 - يعني فيه قطع من جهة لكن لا زال يوصل للمثانة لم يقطع بشكل كلي
 - Treatment : Stenting with a urethral catheter.** دعامات
- **Type III:**(75%)
 - complete tear with no evidence of continuity
 - ما في شي يوصل للمثانة مقطوعة بشكل كلي
 - **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.
- **Posterior urethra is short usually if u see it tall means there is hematoma but still intact = type1**



Small-gauge urethral catheter



Portable Flexible Scopes

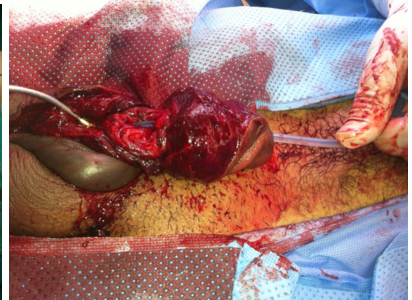


suprapubic catheter or suprapubic cystostomy

External Genital injuries

● Male External genitalia injuries:

- Penile Fracture, eggplant deformity sign (مثل الباذنجان), during sexual intercourse or trauma [picture](#).
- Glans Injury. Mostly because of circumcision.
- Penile amputation and injuries. for emergency put the penis in clean bag then put that bag in another bag of ice but be careful because it's One of two: psychogenic or criminal; so you need to protect yourself, having a security guard is mandatory.
- Scrotal Injuries: Mostly in machinery workers which is rare and easy to repair because of the skin of the scrotum is very spacious if it's injured you can repair it.



● Female External genitalia injuries:

- In sports, crime or during vaginal labour.
- Managed by Gynecologists unless the urethra or the bladder is involved
- In Road traffic accidents it's extremely rare



Recall:

What are the signs of urethral injury in the trauma patient?

"High-riding, ballotable" prostate, blood at the urethral meatus, severe pelvic fracture, ecchymosis of scrotum

What is the evaluation for urethral injury in the trauma patient?

RUG (Retrograde UrethroGram)

What is the evaluation for a transected ureter intraoperatively?

IV indigo carmine and then look for leak of blue urine in the operative field

What aid is used to help identify the ureters in a previously radiated retroperitoneum?

Ureteral stents

How can a small traumatic EXTRAperitoneal bladder rupture be treated?

Foley catheter

What is a "three-way" irrigation foley catheter?

Foley catheter that irrigates and then drain

How should a traumatic INTRAperitoneal bladder rupture be treated?

Operative repair

What percentage of patients with an injured ureter will have no blood on urinalysis?

33%

