



432 Surgery Team

6

EMERGENCIES IN UROLOGY



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COLOR GUIDE: • Females' Notes • Males' Notes • Important • Additional

1 INTRODUCTION AND CLASSIFICATION

- Require rapid diagnosis and immediate treatment.
- Compared to other surgical fields there are relatively few urological emergencies
- **Classification/topics**

Note:

We will talk about emergencies in both male and female

o Non-traumatic:

- ✓ Hematuria
- ✓ Renal colic
- ✓ Urinary retention
- ✓ Acute scrotum
- ✓ Priapism

o Traumatic:

- ✓ Renal trauma
- ✓ Ureteral injury
- ✓ Bladder trauma
- ✓ Urethral injury
- ✓ External genital injury.

IMPORTANT NOTES FROM EXTERNAL RESOURCES

	Notes
Raslan mauual surgery 351	Notes are written in purple
431 teams work	Notes are written in orange
Websites	Notes are written in light blue.

2 NON-TRAUMATIC UROLOGICAL EMERGENCY.

2.1 HEMATURIA

Definition: blood in the urine

Types:

o Gross (macroscopic, visible, clinical):

- ✓ emergency or urgency
- ✓ Up to 40% is malignancy
- ✓ 1 ml of blood in 1 liter of urine is **visible** for the patients

o Microscopic (Not visible, not clinical)

- ✓ Not an emergency or urgency
- ✓ Here the patient is told that he has Hematuria
- ✓ 3 or more RBC/high power field, in 2 out of 3 properly collected samples (AUA)
“But not always 3 and more, but in high risk patients 1 RBC is indication”

Causes: “mainly of emergency gross haematuria”

- o They vary according to:
 - * **patient age** “common cause of haematuria is in adolescent not children”
 - * **presence of symptoms**
 - * **presence of risk factors for malignancies** e.g age, smoking which is no. 1 risk factor for malignancy (transitional cell tumor of renal pelvis ureter and Bladder). Transitional cell tumor also in pt work in painting and tire manufactures. Bilharzias for squamous cell carcinoma.
 - * **the type (gross/microscopic)**
 - * **They could be:**
 - * Pre renal **systemic**: SLE, Sickle cell disease, hemophilia, anticoagulants, liver disease or failure.
 - * Renal: Tumor (benign or malignant), Renal stasis, Stone, TB,
 - o Glomerulonephritis, arteriovenous malformation, renal stasis.
 - * Post Renal: Tumor (bladder or ureter), Bilharzias, Prostate pathology, urethral stricture, urethral polyp/tumor.

Note:

~~~~~  
40-60% of pts present with malignancy

only 30% present with malignancy. Detected by mid stream urine

~~~~~

History: Very important to diagnose ⓘ

- * Chief complaint:
- * Age
- * Residency: Bilharzias is common in Jizan
- * Duration
- * Occupation: Factories
- * Painful or painless:
 - Painful because of ischemia: Stones, UTI, Trauma, Renal vein thrombosis
- * **Timing:** helps in recognizing the site of the bleeding:
 - Initial: urethra
 - Terminal: bladder neck or triagone
 - Total: rest of the bladder and upper tract
"Severe and massive causes"
- * How dark colored is the urine? "Bright red means low bleeding, dark high"
- * Amount of bleeding
- * Clots and shape of it "Clots means severe bleeding. Shape help you in determine the site, if it's rounded (mostly distal track, bladder and up) or sausage-like /thread-like (ureter or kidney)"
- * Trauma could cause both painful and painless
- * bleeding from other sites "hematological or systemic cause"
- * Associated urinary and other systemic symptoms
- * History of: bleeding disorders, SC (sickle cell), TB, infections, bilharzias, and stones.
- * Family history of malignancy or hematological disease "especially for
 - young pt" e.g hemophila or prostatic cancer
- * Drugs "like anticoagulant , red or orange discoloration caused by some drugs like Rifampicin for TB "
- * colored foods and drinks especially in children "beta vulgaris" البنجر
- * **SMOKING:** asking about smoking is very crucial because it is known to be a risk factor for bladder transitional cell carcinoma and renal cancer especially in KSA , ask even in female or young age

Notes:

- Usually transitional cell carcinoma (TCC) originating from the urothelium of the bladder.
- Risk factors for TCC: Smoker, above 40 LUTS , Lower urinary tract symptom irritation, radiation to the pelvis, bilharzias
- in painless hematuria: 1st thing to think about it is "cancer" unlike painful hematuria which may indicate stones, UTI trauma, pyelonephritis while cancer will be at the bottom of the list

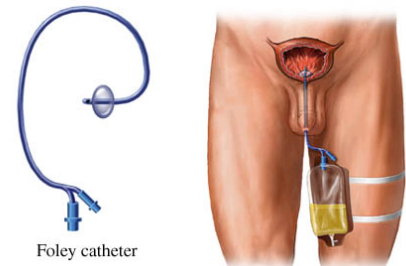
Note:

Trauma and smoking are 2 important questions in any Hx

Management:

o gross hematuria mandate full Work up :

- ✓ History
- ✓ P/E= (not much signs) **except in some cases like sickle cell disease** so it's a disease of investigation and workup because when people see blood they come early
- ✓ Investigations: Single most important imaging method is CTU (CT Urography) ⓘ
- ✓ 3 way urethral catheter = **foleys catheter** and wash out heavy bleeding
- ✓ Treat the underlying cause



Note:

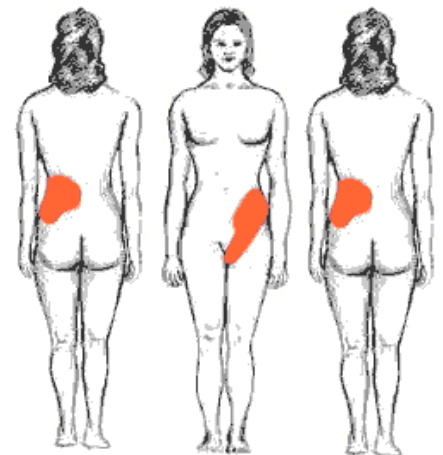
- 40% of gross hematuria cases in ER are malignancy, while only 2% of microscopic hematuria cases in ER might be malignancy.
- 70-80% of patients on warfarin come with hematuria.

2.2 RENAL COLIC

- The **most common** urological emergency (in Saudi Arabia ,cases are seen daily)
- One of the **most common** (causes) differentials associated with acute abdomen
- Characteristically: **Sudden** onset of severe **wake them from sleep** pain in the flank

2.2.1 HISTORY OF PAIN: ⓘ

- Sudden onset, intermittent, relieved by analgesia & nothing aggravates it
- Colicky in nature
- Usually Radiate: **why? share the same dermatome**
 - o The kidney and upper ureter are innervated from dermatomes T7toT9.



- ✓ So in men the pain will radiate to the **testicle** because it embryological originates from the same site and then the testicle descends
 - o Mid ureter: dermatome T10 > radiate to the iliac fossa (**midgut**)
 - ✓ If this happens in right side can be confused with appendicitis
 - o Distal ureter: dermatome T12> triagone of the bladder **which may cause urinary retention and frequency**, posterior urethra, scrotal skin, labia majora and lower abdomen
- Location may change from the flank to the groin SO the location of the pain is not a good indicator of the location of the stone
- Patient is not comfortable and might be rolling around
- Associated with nausea/vomiting
- Ureter stones:
 - o Sudden severe pain
 - o Urinary symptoms and suprapubic pain
- Remember that the pain of a renal colic is very painful, one of the worst a human can experience **others are MI and labour**

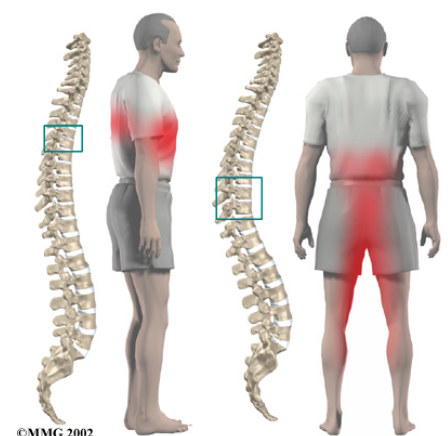
Note:

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*Stone in kidney : dull or no pain*  
*In ureter : sever pain*  
 ~~~~~

2.2.2 DIFFERENTIAL DIAGNOSIS

Any pathology in the lower chest or abdomen

- **Radiculitis (pseudo-renal)** which is the most confusing ddx
 - ✓ Musculoskeletal pain that happens due to irritation of the nerve root in the intervertebral foramen
 - ✓ A common form of it is sciatica
 - ✓ Irritation of the intercostal nerves (T7,8,9) can give a similar picture **and it is also sever**
 - ✓ Usually aggravated by movement unlike stones that are relieved by Movement
 - ✓ Radiates to lower limb if involving sciatic nerve roots **unlike stones**
 - ✓ History: back pain and predisposed mobility (carrying something heavy)



- **Chest:** Pneumonia and Myocardial infarction
- **Abdomen:** leaking (**ruptured**) abdominal aortic aneurism, bowel obstruction, acute appendicitis,
- IBD (Crohn's, ulcerative colitis), burst peptic ulcer and diverticulitis.
- **Pelvis:** Ectopic pregnancy and ovarian pathology (twisted cyst)
- Testicular torsion

2.2.3 WORK UP:

- **History**

- **Examination:**

- o **Patient wants to move around** to find a comfortable position. This helps in differentiating from appendicitis (movement in appendicitis will cause more irritation to peritoneum so it will cause more pain)
- o +/-Fever: indicates infection and needs extra hydration

- **Investigations:**

- o Pregnancy test "to differentiate from ectopic pregnancy and because usually we do x-ray"
- o MSU Mid stream urine: for Hematuria and urine analysis "high creatinine is indication"
- o U&E Urea and electrolytes: asses renal function

- **Radiological investigation:**

- o Helical CTU -CT without contrast: =plane CT=spiral CT for stone

✓ **Imaging modality of choice diagnostic and initial**

- ①
- ✓ Greater specificity (95%) and sensitivity (97%) for diagnosing ureteric stones **even radiolucent**
- ✓ Can identify other, **organic** non-stone causes of flank pain.
- ✓ No need for contrast administration.
- ✓ Faster, taking just a few **3** minutes
- ✓ the cost of CTU is equivalent to that of IVU
- ✓ **contrast is dangerous, it may cause renal failure in pt with renal impairment & anaphylactic shock in pt with bronchial asthma and allergy**

Note:

~~~~~  
*Radiology images are below*  
 ~~~~~

o Intravenous urogram (IVU): X-Ray and contrast before and after injection was the gold standard in the past, Can confirm the presence of the stone

o KUB: Plain X-ray of the kidney, ureter and bladder to show if stone is oblique or radiolucent but it's not that sensitive

" Look at the details of the bone 1st, then the soft tissue shadow which is sometime penetrated by hematoma or perinephric collection. After that, look at the shadow of the kidney if normal or increased. Then, follow the root of the ureter, you don't see the ureter but you know that it's at the tip of transverse process. Look for any radiopaque (most of the stones are)"

o Renal ultrasound (RUS): not good for investigating stones
"Stones in the ureter are not seen by the US & not good enough to decide the diagnosis. Not anatomical"

Note:

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*In US: Hyperechoic +shadow = usually stone*  
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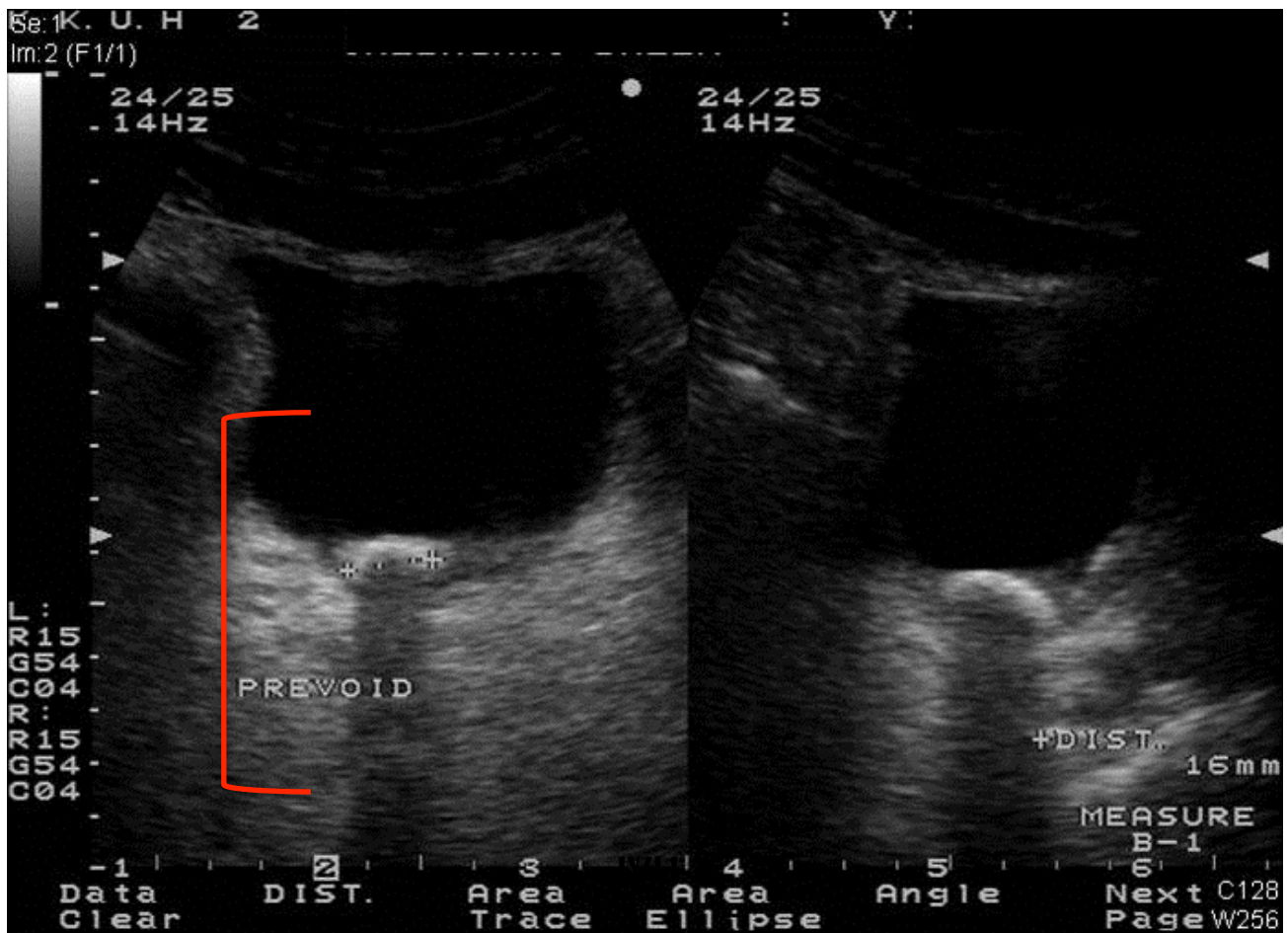
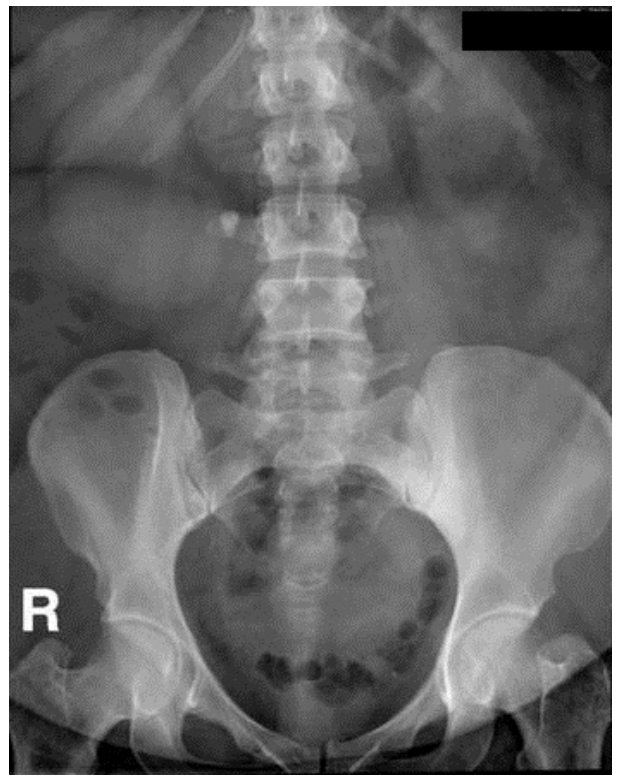
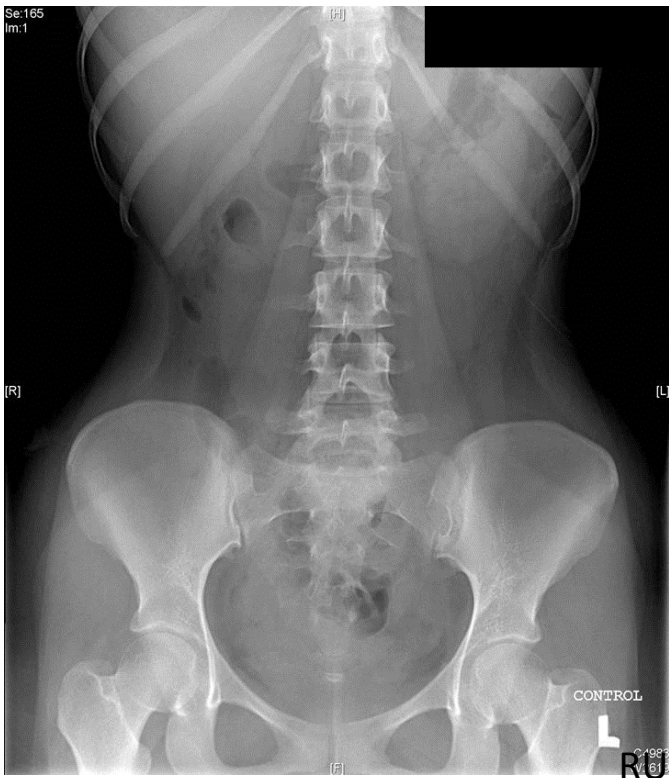
o MRI: "very rare, not a standard except for pregnant ladies"

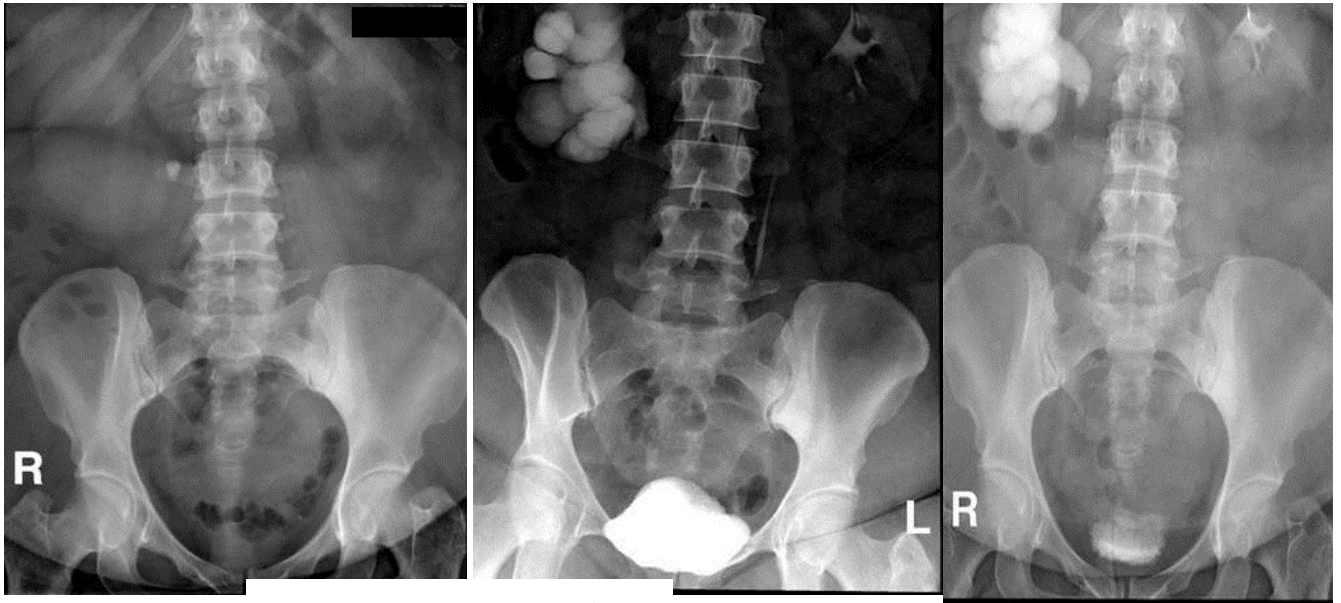
- ✓ Very accurate way of determining whether or not a stone is present in the ureters
- ✓ Time consuming and expensive (not available in all hospital)
- ✓ Good for pregnant ladies (no radiation)

Note:

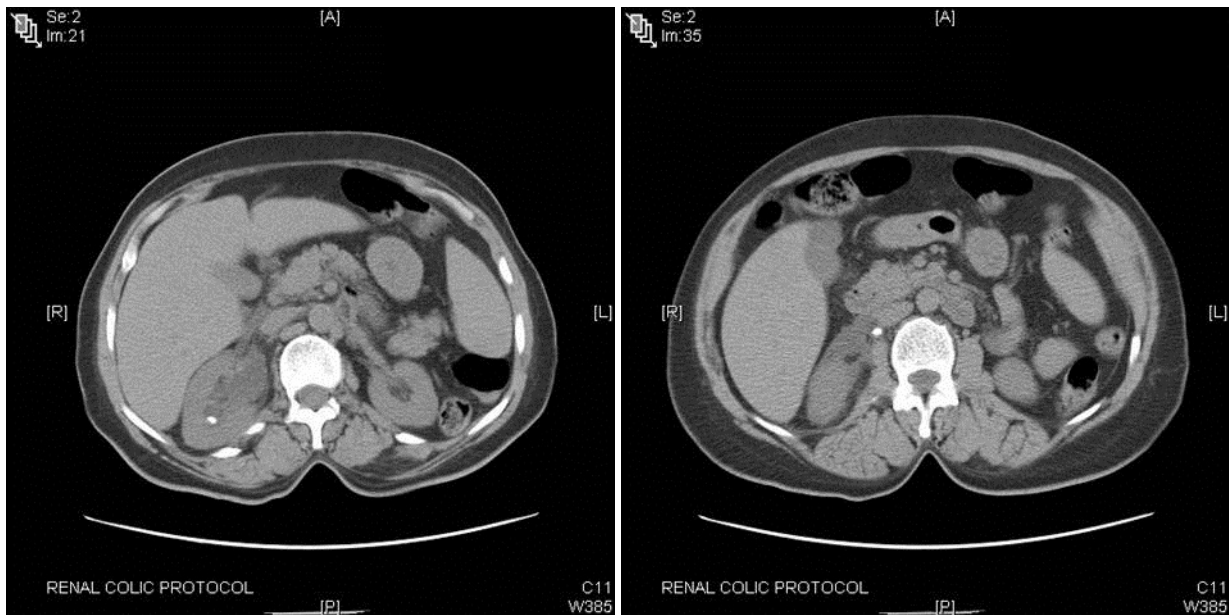
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*Fats around the kidney are usually black, when u see white lines "perinephric stranding" it's a sign of obstruction*  
~~~~~


KUB

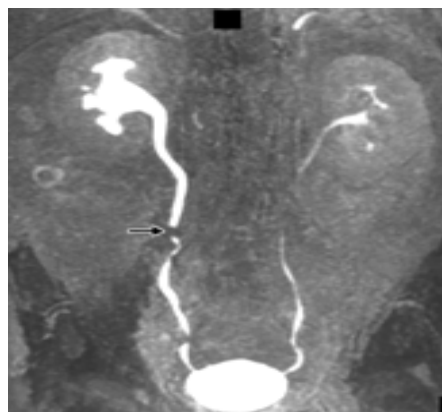




CTU



MRI



2.2.4 MANAGEMENT:

· Medical:

o Pain relief :1st thing to do

- ✓ NSAID (IM, IV, Oral or per rectum (suppository)) e.g. ibuprofen and voltaren
- ✓ +/- Opiates analgesics (pethidine or Morphine) when NSAID is contraindicated or did not respond to it

o Hyper hydration (IV-fluids and drinking water)

o Watchful waiting with analgesic supplements: **95% of stones measuring 5 mm or less will pass on their own** ⓘ
and 70% of stones measuring 7 mm will pass on their own

· Surgical

o Indications for surgery: ⓘ

To relieve obstruction and/or remove the stone

1. Pain that **fails** to respond to analgesia
2. Associated **fever**: kidney must be drained to reduce risk of Pyelonephritis
3. Impairment in renal function because of the stone (solitary kidney obstructed by a stone, or bilateral ureteric stones) causing uremia
4. Obstruction is unrelieved, for not exceed 4 weeks (Because after 4 wks. the obstruction will cause necrosis)
5. Personal or occupational reasons: doctors or pilots

o Types of surgical intervention:

✓ **Temporary relieve of obstruction:**

- JJ stent from renal pelvis to bladder **it's coiled**
- Percutaneous nephrostomy tube

✓ **Definitive treatment: from less invasive**

- Extracorporeal ShockWaves Lithotripsy (**ESWL**) “non-invasive, just crush the stone by shocking it. For large stone”
- Percutaneous Nephrolithotomy (**PCNL**) “make small hole, insert the scope, crush big stone and remove it subcutaneously”
- Uretroscopy (**URS**) commonly used and known as laser, **it's small in size, good for small stones**
- Laparoscopic extraction (**rare**) & Open surgery (very limited)

2.3 URINARY RETENTION

2.3.1 ACUTE URINARY RETENTION

- **Painful** (**chronic is painless**) inability to void with relief of pain following drainage of the bladder by catheterization

Causes:

o Men: **more in men, rare in women**

- ✓ **Benign prostatic enlargement (BPE) due to BPH** “Benign prostatic hyperplasia” is the most common cause (usually in >40 years of age) ⓘ
- ✓ Carcinoma of the prostate
- ✓ Abscess in the prostate
- ✓ Stones
- ✓ Constipation
- ✓ Urethral stricture

Note:

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*Always these patients are diabetic*  
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o Women:

- ✓ Pelvic organ prolapsed (cystocele, rectocele, uterine prolapse)
- ✓ Urethral stenosis “very rare”
- ✓ Urethral diverticulum “very rare”
- ✓ Post surgery for stress incontinence **the most common**
- ✓ Pelvis masses (e.g. Ovarian mass) **rare**

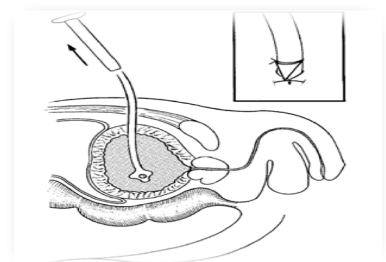
Management:

o Initially: **to relieve the pain**

- ✓ Urethral catheterization: “**if it can't pass, consider suprapubic catheter**”
 - Using a 3 way or Foley's catheter
 - Make sure to give adequate analgesia to prevent spasm

- ✓ Suprapubic catheter (SPC):
 - Passed directly to the bladder through the skin
 - Used when urethra cannot be accessed (stricture)

o Definitive treatment: treat the underlying cause



2.3.2 CHRONIC URINARY RETENTION: usually seen in diabetic nephropathy patients



- Obstruction here develops slowly and the bladder is distended (stretched) very **gradually** over weeks/months
- **Pain is not a feature** ⓘ
- Can be associated with:
 - Reduced renal function or renal failure
 - Upper tract dilation and hydronephrosis
- **Presentation:** ⓘ
 - Urinary dribbling
 - **Overflow** incontinence = **false incontinence** (vesicle pressure exceed the urethral pressure)
 - Palpable bladder with no pain
- **Management:**
 - In general it is more difficult than acute retention because the cause is usually neurological
 - Treatment is directed to renal support.
 - Renal support and treat electrolyte imbalance "**Hyperkalemia**"
 - Bladder drainage in a slow rate to avoid sudden decompression (can cause **self-limiting Hematuria**)
 - Late treatment of the underlying cause

2.4 ACUTE SCROTUM: ⓘ ⓘ

- Also known as scrotal pain or testicular pain
- **Emergency situation** requiring prompt evaluation, differential diagnosis, and potentially immediate surgical exploration (it's rapidly aggressive)
- Differential diagnosis (the box ->)

o Epididymitis

- ✓ **Most common cause**
- ✓ **Can also be Epididymo-orchitis**

o Torsion of the spermatic cord: the **most serious** complication!

Torsion of the spermatic cord Torsion of the appendix testis Torsion of the appendix epididymis Epididymitis Epididymo-orchitis Inguinal hernia Communicating hydrocele Hydrocele Hydrocele of the cord Trauma/insect bite Dermatologic lesions Inflammatory vasculitis (Henoch-Schönlein purpura) Idiopathic scrotal edema Tumor Spermatocele Nonurogenital pathology (e.g., adductor tendinitis)

2.4.1 TORSION OF THE CORD

General consideration:

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



Anatomical variations: predisposing factors

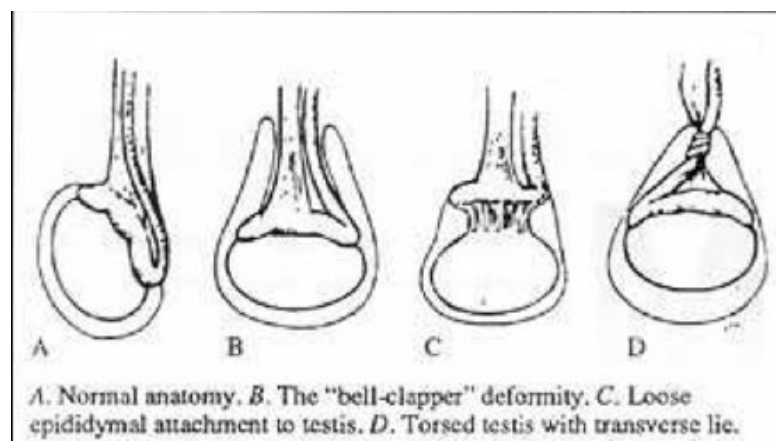
A. normal longitudinal lie

B. Bell clapper deformity. Tunica vaginalis surrounds the whole testicle so it is very loose **like a child who is wearing his father thoub**

C. Loose epididymal attachment to the testis

D. Torsed testis with transverse or oblique lie

- Types: (doctor said it's not important, don't make any difference in the management)
 - Extra-vaginal
 - Intra-vaginal



Presentation: ⓘ

- Acute onset of scrotal pain (ischemia!)
 - Sharp and severe
 - May be intermitting due to torsion then detorsion
- Majority have a history of prior episodes of severe, self limited scrotal pain and swelling
- Nausea and vomiting due to the pain "referred to the lower abdomen"
- Referred to the Ipsilateral lower quadrant of the abdomen (inguinal area)
- Children may present with abdominal pain.
 - **So any child that complains of severe abdominal pain may need to have a genital examination** it's a congenital disease but may be aggravated later on by moving or other factors.
 - 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)
pyelonephritis is rare in children



Physical exam: ⓘ

- The affected testis is high riding transverse orientation
- Acute secondary hydrocele or massive scrotal edema
- **Absent cremasteric reflex**(because the nerve is within the spermatic cord) through gentiofemoral nerve
- Testis is tender and larger than other side: the patient will not let you touch it
Elevation of the scrotum causes MORE pain because there is ischemia, so elevation will decrease the blood more (unlike Epididymitis)

Adjunctive test:

(If the diagnosis is clinically suspicious don't delay the patient for any investigations, send the patient to the OR immediately except if you have an US in the ER

- Adjunctive tests aid in the deferential diagnosis
- Confirm the ABSENCE of torsion

- Tests used:
- **Sound Doppler examination of the cord and testis:** high false positive and false negatives

- **Color Doppler ultrasound:** (figure1)

Investigation of choice

- ✓ Done in the OR a lot of the time.
- Assessment of anatomy and determining the presence or absence of blood flow- to see the arterial blood supply of the testis

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

- ✓ sensitivity: 88.9% specificity of 98.8%
- ✓ **Operator dependent.**

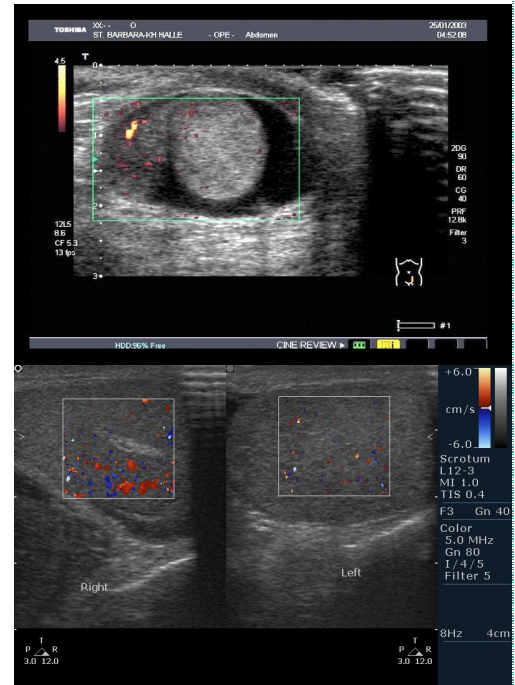


figure 1

- **Radionuclide imaging:** (figure 2)

- ✓ Assesses testicular blood flow
- ✓ Shows a **photopenic area** in cases of torsion
- ✓ False impression from hyperemia of scrotal wall
- ✓ **Sensitivity of 90%** and specificity of 89%
- ✓ Not helpful to determine a hydrocele or hematoma (does not assess anatomy)

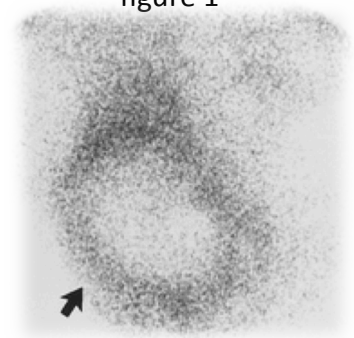


figure 2

- **Surgical exploration:**

- ✓ Diagnostic and therapeutic ⓘ
- A scrotal incision is done and the affected site is 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 **why?**



1- faster recovery 2-necrotic testis may affect the other testis

- ✓ If the testis is to be preserved, it should be fixed "to the wall"
- ✓ The contra-lateral testis must be fixed to prevent subsequent Torsion even if the first testis is dead

2.4.2 EPIDIDYMO-ORCHITIS

Presentation:

- o **Common** in Saudi Arabia (can be a manifestation of **Brucella**) Viral causes: (coxsackie virus, mumps virus)
- o Indolent process. Start gradual with little or no pain and this is the big difference between orchitis and torsion (sudden & severe pain)
- o gets severe towards the end
- o Scrotal swelling, erythema and pain.
- o **Dysuria** and fever are common
- o Patients with history of STD like gonorrhea urethral discharge or UTI

Physical examination

- o **Localized epididymal tenderness**
- o Swollen and tender epididymis. Or massively swollen hemi-scrotum with absent of landmarks "if only the epididymis is effected, it will be epididymal tenderness only but the rest of the testis is normal"
- o Cremasteric reflex is **present**. ⓘ
- o Patient feels less pain when the scrotum is raised



(Urine analysis might show pyuria, **bacteruria** and/or positive culture and (WBC).

Management:

- o Bed rest for 1-3 days then relative restriction
- o Scrotal elevation with athletic supporter
- o Parental or Oral **antibiotics** should be instituted when UTI is documented or suspected "first treat the infection and then do the procedure"
- o AVOID urethral instrumentation If the pt. have urethral problems like restriction, don't do instrumentation if he have acute Epididymo-orchitis, treat him first and do it later to prevent septicemia ⓘ

2.5 PRIAPISM

- **Defined** as a persistent erection of the penis for more than 4 hours that is not related or accompanied by sexual desire “at any age but mainly age group affected more likely are 5-10 years old & 20-50 years old”
- **Causes:** ⓘ
 - Primary (idiopathic) in 30-50% of the cases
 - Secondary (as mentioned above): Drugs “Like alpha reductase inhibitor, some prostaglandins”, trauma, neurological hematological disease, malignancies “infiltration of the corpora cavernosa (pelvic or prostate)”
- **Types of Priapism:**

	Ischemic	Non-ischemic
called	<u>veno-occlusive or low flow</u>	Arterial or high flow
More common	<u>Most common type</u>	---
pain	<u>Painful type</u> “pt. can’t pass urine”	Painless type “erection not strong as ischemic”
Patho-physiology	<p>thrombosis of the venous system causing congestion and engorgement which leads to the erection</p> <p>Causes include:</p> <ul style="list-style-type: none"> • Hematological disease: Sickle cell ⓘ, most common in ksa • <u>Malignancy that infiltrated the corpora cavernosa e.g lymphoma</u> • <u>Drugs like prostaglandin injection</u> 	<p>secondary to trauma in perineum or pelvic which creates fistula between the artery and vein then the blood clots will accumulate in corpus spongiosum leading to erection”</p>

- 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.

- **Diagnosis:**

- o Obvious from history!

- ✓ Erection for more than 4 hours
- ✓ Document if it is painful or not "To know if it ischemic or not"
- ✓ Previous history of Priapism or trauma "Recurrence in hematological disease pts"
- ✓ Ask about predisposing factors and possible causes

- **Examination:**

- ✓ Erect penis that can be tender (in low flow)
- ✓ Characteristically the corpora cavernosa are rigid and the Glans is flaccid
- ✓ Abdominal examination for evidence of malignancy "Also look for any palpable lymph node"
- ✓ Digital rectal exam: to examine the prostate and check for anal tone (neurological assessment)

- **Investigations:**

- o CBC (white cell count and differential, reticulocyte count)
- o Hemoglobin electrophoresis for SCD "sickle cell"
- o Urinalysis including urine toxicology
- o Blood gases taken from either corpora

Variable	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)
pO2	<30 mmHg (hypoxia)	>90 mmHg (normal)
pCo2	>60 mmHg (hypercapnia)	<40 mmHg (normal)

above ninety bcuz most of the blood is arterial

- o Color flow duplex ultrasonography in cavernosal arteries:

- ✓ Ischemic: in flow is low or nonexistent
- ✓ Non-ischemic: inflow is normal to high

- o Penile pudendal arteriography in cases of trauma

Note:

In reality, they only order CBC
And Penile pudendal arteriography if we have suspicion of fistula (non-ischemic), if you found it, you can treat it by immobilizing the artery. Arteriograph the pudendal artery"

- **Treatment:**

- o Depends on type of Priapism

- o Conservative treatment should be tried first “Most of the time. Ask the pt to climb the stairs to open venous channels if he could not start the medical and surgical treatment”

- o Medical treatment: bicarbonates, high o2 and cold enema

- o Surgical treatment: “Sometimes we have to shunt and treat the underlying cause. Aspiration, saline wash carbora & typical type of shunt”

- o Treat the underlying cause the treatment usually combined exchange-transfusion-bicarbonate-oxygenation and other measure

- “it’s IMP to warn all the pts wit priapism of the possibility of impotence”

Note:

Management is Hydration and bicarbonate. If non-ischemic, ligation.

3. Traumatic Urological Emergencies

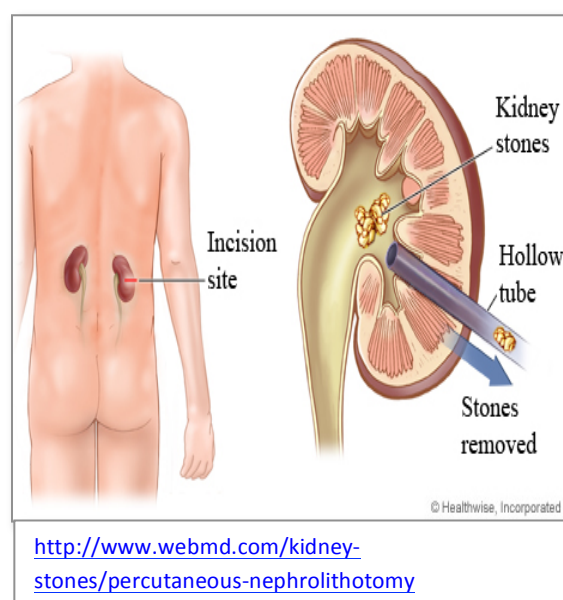
3.1. Renal Injuries

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

Mechanism and Cause:

- **Blunt:** direct blow or acceleration/deceleration (Road Traffic Accidents “RTAs”, falls from height, or fall onto flack). Common in KSA

- **Penetrating:** knives, gunshots, iatrogenic, e.g. Percutaneous Nephrolithotomy “PCNL”.



Percutaneous Nephrolithotomy: or Nephrolithotripsy uses a small incision in the person's back to remove kidney stones. The surgeon puts a hollow tube into the kidney and a probe through the tube. In Nephrolithotomy, the surgeon removes the stone through the tube. In Nephrolithotripsy, he or she breaks the stone up and then removes the fragments of the stone through the tube. <http://www.webmd.com/kidney-stones/percutaneous-nephrolithotomy>

Indications for Renal Imaging:

- ✓ Macroscopic hematuria.
- ✓ Penetrating chest, flank, and abdominal wounds.
- ✓ Microscopic (> 5 RBCs per high powered field or dipstick).
- ✓ Hypotensive patient (systolic blood pressure <90 mmHg).
- ✓ A history of rapid acceleration or deceleration.
- ✓ Any child with microscopic or dipstick hematuria who has sustained trauma.

Note:

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*When we decide to do radiology? If there is direct injury to the kidney or hematuria.*

**The gold standard:  
Contrast CT scan.**  
~~~~~

Modalities available:

1. IVU:
 - a- Widely replaced by CT scan with contrast
 - b- On table IVU: if patient is transferred immediately to the operating table without having had a CT scan and retroperitoneal hematoma is found
 - c- Done to see if other kidney is functioning and/or exist because the injured kidney might have to be removed
2. CT scan:
 - a- Without contrast: doesn't allow accurate staging "called Spiral CT"
 - b- With contrast: **imaging modality of choice** + other abdominal injuries can be assessed
3. Renal Ultrasound

Note:

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*On-table IVU: for the patients who transferred directly to the OR without having a CT scan a retroperitoneal hematoma is found.*  
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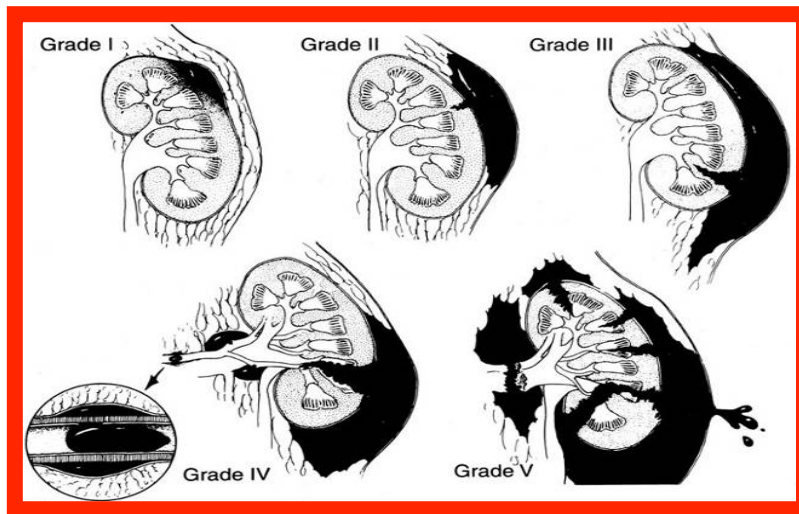
The advantages and disadvantages of renal US:

Can establish the presence of two kidneys, or retroperitoneal hematoma, and power Doppler can identify the blood flow in the renal vessels. **"Appropriate for following up the patient"**.

But, it can't accurately identify parenchymal tears, collecting system injuries, or extravasations of urine until a later stage when a urine collection has had time to accumulate.

Contrast-enhanced CT scan: accurate, rapid, and images other intra-abdominal structures "Gold standard for renal injuries".

Renal Injury Grading:



According to the depth and involvement of the urinary collecting system and renal vessels:

- **Grade I:** contusion or non-enlarging subcapsular hematoma, but no laceration.
- **Grade II:** superficial laceration <1cm depth and does not involve the collecting system; non expanding perirenal hematoma.
- **Grade III:** laceration >1cm, without extension into the renal pelvis or collecting system and with no evidence of urine extravasation.
- **Grade IV:** laceration extends to renal pelvis or urinary extravasation vascular: injury to main renal artery or vein with contained hemorrhage.
- **Grade V:** shattered kidney.

<http://radiopaedia.org/articles/renal-trauma-grading>

Management:

Conservation, 50% of renal stab and 25% of renal gunshot wounds manages over 95% of blunt injuries. **And it includes:** wide bore IV line, IV antibiotics, bed rest, vital signs monitoring, serial CBC "**Hematocrit (HCT)**", and follow-up by ultrasound and/or CT scan.

When do we explore the peritoneum surgically?

If there is: **persistent bleeding (persistent tachycardia and/or hypotension failing to respond to appropriate fluid and blood transfusion), expanding peri-renal hematoma (signs of continuous bleeding), or pulsatile peri-renal hematoma.**

Note:

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- **In conclusion**, the four main indications for surgical exploration are: hypotension, not responding to IV fluids, expansion of retroperitoneal hematoma, or pulsatile hematoma.  
- **In case of un-controlled hemorrhage**, remove the kidney.  
~~~~~

3.2 Ureteral Injuries

The ureters are protected from external trauma by surrounding bony structures, muscles and other organs. **It could be injured by external and internal trauma.**

-External traumas are rare in general, sever force is required blunt or penetrating. Blunt external trauma is sever enough to injure the ureters, and it will be usually associated with multiple other injuries. Knife or bullet wound to the abdomen or chest may damage the ureter, as well as other organs.

-Internal traumas are uncommon as well, but still more common than the externals. The cause is usually surgery:

1. Hysterectomy.
2. Oophorectomy.
3. Sigmoidcolectomy.
4. Ureteroscopy.
5. Caesarean section.
6. Aortoiliac vascular graft replacement.
7. Laparoscopic.
8. Orthopedic operations.

Diagnosis: Requires a high index of suspicion. **It could be intra-operative or late.**

Late diagnosis:

1. An ileus: the presence of urine within the peritoneal cavity.
2. Prolonged postoperative fever or overt urinary sepsis.
3. Persistent drainage of fluid from abdominal or pelvic drains, from the abdominal wound, or from the vagina. **“More than 70 ml”.**
4. Flank pain if the ureter has been ligated.
5. An abdominal mass, representing an urinoma.
6. Vague abdominal pain.

Ileus: occurs from hypomotility of the gastrointestinal tract in the absence of mechanical bowel obstruction.

<http://emedicine.medscape.com/article/178948-overview>

Note:

Urine in the peritoneal cavity will cause an ileus, then absent bowel sounds.

Diagnosis of ureter injury:

1. **Persistent abdominal drainage > 70ml.**
2. **In GYN: flank pain.**
3. **Distended abdomen and absent bowel sounds.**

Treatment Options:

1. JJ stenting **“For partial injuries”**.
2. Primary closure of partial transection of the ureter.
3. Direct ureter-to-ureter anastomosis.
4. Re-implantation of the ureter into the bladder using a psoas hitch or a Boari flap.
5. Trans uretero-ureterostomy.
6. Auto-transplantation of the kidney into the pelvis.
7. Replacement of the ureter with ileum.
8. Permanent cutaneous ureterostomy.
9. Nephrectomy.

IMPORTANT NOTES FROM EXTERNAL RESOURCES

Notes	
http://emedicine.medscape.com/article/1893904-overview	1. Ureteroneocystostomy (UNC) refers to reimplantation of the ureter into the bladder. In the adult population, Ureteroneocystostomy is primarily used for disease or trauma involving the lower third portion of the ureter that results in obstruction or fistula. Ureteroneocystostomy is the procedure of choice to correct distal ureteral injuries in close proximity to the bladder that measure 3-5 cm. Modifications, such as a psoas hitch (tacking the posterior bladder wall to the psoas muscle) and a Boari flap (tubularization of a flap of bladder to extend from the bladder to the ureteral orifice), allow for correction of ureteral defects that are longer than 5 cm.
http://emedicine.medscape.com/article/449389-overview	2. Transureteroureterostomy (TUU) is a urinary reconstruction technique that is used to join one ureter to the other across the midline. It offers patients with distal ureteral obstruction an option to live without external urostomy appliances or internal urinary stents.

3.3 Bladder Injuries

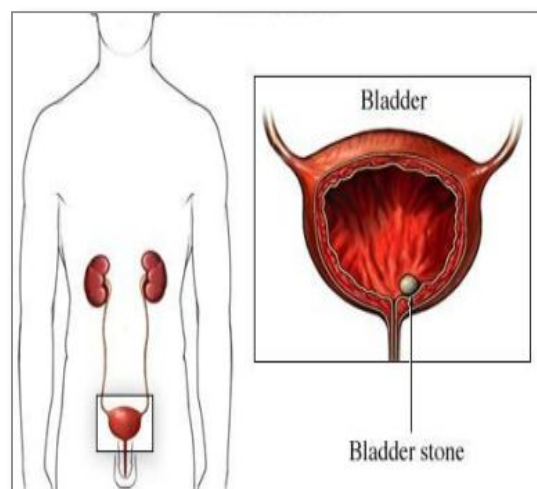
Causes: **Iatrogenic injury.**

- Transurethral resection of bladder tumor (TURBT).
- Cystoscopic bladder biopsy.
- Transurethral resection of prostate (TURP).
- Cystolitholapaxy.
- **Caesarean section**, especially as an emergency. “Common”
- Total hip replacement (very rare).
- Penetrating trauma to the lower abdomen or back.
- Blunt pelvic trauma, in association with pelvic fracture or minor trauma in a drunken patient.
- Rapid deceleration seat belt injury with full bladder in the absence of a pelvic fracture.
- Spontaneous rupture after bladder augmentation.

Note:

Cystolitholapaxy: is a procedure to break up bladder stones into smaller pieces and remove them.

<http://www.med.nyu.edu/content?ChunkIID=620491>

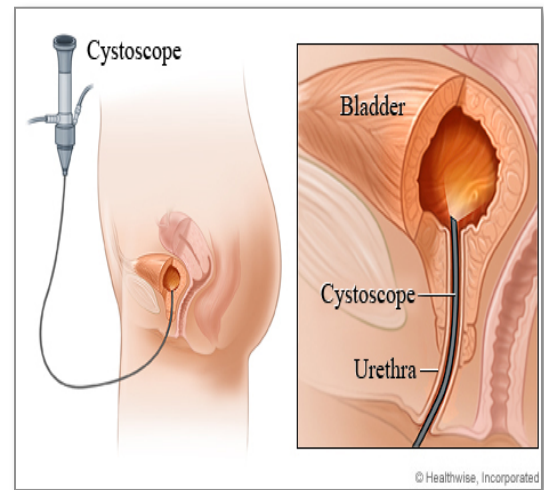


<http://services.epnet.com/getimage.aspx?imageid=8131>

Note:

Cystoscopy: is a test that looks at the inner lining of the bladder and the tube from the bladder to the outside of the body (urethra). The cystoscope is a thin, lighted viewing tool that is put into the urethra and moved into the bladder. A cystoscopy can check for stones, tumors, bleeding, and infection, also can be used to treat some bladder problems, such as removing small bladder stones and some small growths.

<http://www.webmd.com/cancer/bladder-cancer/cystoscopy-of-the-bladder>



<http://www.webmd.com/cancer/bladder-cancer/cystoscopy-of-the-bladder>

Types of Perforation:

A. Intra-peritoneal perforation: the peritoneum overlying the bladder has been breached along with the wall of the bladder, allowing urine to escape into the peritoneal cavity.

B. Extra-peritoneal perforation: the peritoneum **is intact** and urine escapes into the space around the bladder, but not into the peritoneal cavity.

Presentation:

Recognized intra-operatively. **The classic triad of symptoms and signs those are suggestive of a bladder rupture:**

- ✓ Suprapubic pain and tenderness.
- ✓ Difficulty or inability to pass urine.
- ✓ Hematuria.

Management:

-Extra-peritoneal: bladder drainage or open repair

-Intra-peritoneal: open repair (suture) because it is unlikely to heal spontaneously, usually large, leakage causes peritonitis, and it is associated with other organ injury.

3.4 Urethral Injuries

They could be either anterior or posterior urethral injuries.

Anterior Urethral Injuries:

Generally rare, mechanisms:

1. The majority resulted from a straddle injury in boys or men.
2. Direct injuries to the penis.
3. Penile fractures. “common in Iran”
4. Inflating a catheter balloon in the anterior urethra.
5. Penetrating injuries by gunshot wounds.

Signs and Symptoms of Anterior Urethral Injuries:

- Blood at the end of the penis.
- Difficulty in passing urine.
- Frank hematuria.
- Hematoma may accumulate around the site of the rupture.
- Penile swelling.

Diagnosis of Anterior Urethral Injuries

By **Retrograde urethrography**

In case of:

-Contusion: there will be no extravasation of contrast.

-Partial rupture: there will be extravasation of contrast, with contrast also present in the bladder.

-Complete disruption: there will be no filling of the posterior urethra or bladder.

Note:

How could we differentiate between the anterior and posterior urethra?

The anterior urethra is approximately 16 cm long and lies within the perineum (proximally) and the penis (distally), surrounded by the corpus spongiosum. The posterior urethra is 4 cm long and lies in the pelvis proximal to the corpus spongiosum, where it is acted upon by the urogenital sphincter mechanisms.

(From Gray's Anatomy: The Anatomical Basis of Clinical Practice)



Note:

A retrograde urethrogram (RUG) is a diagnostic procedure performed most commonly in male patients to diagnose urethral pathology such as trauma to the urethra or urethral stricture.

<http://emedicine.medscape.com/article/1893948-overview>

Management of Anterior Urethral Injuries:

Contusion

A small-gauge urethral catheter for one week.

Partial rupture of anterior urethra

Urethral catheterization using cystoscopy and guide wire, or suprapubic urinary diversion for one week, or immediate repair for penetrating partial disruption.

Complete rupture

Unstable patient: suprapubic catheter. Stable: immediate repair or suprapubic catheter.

Penetrating injury

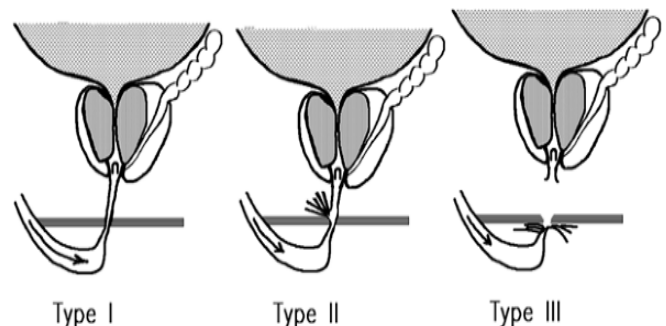
Surgical debridement and repair.

Posterior Urethral Injuries: majority occurs in association with pelvic fractures “Road Traffic accidents”, 10% to 20% have an associated bladder rupture.

Signs: blood at the meatus, gross hematuria, perineal or scrotal bruising, and high-riding prostate by digital rectal exam. (Because of hematoma compression)

Classification of Posterior Urethral Injuries:

- **Type I: “Rare”**
Stretch injury with intact urethra.
- **Type II: “25%”**
Partial tear but some continuity remains.
- **Type III: “75%”**
Complete tear with no evidence of continuity. In women, partial rupture at the anterior position is the most common urethral injury associated with pelvic fracture.



Management of Posterior Urethral Injuries:

Stretch injury (**type I**) and incomplete urethral tears (**type II**) are best treated by stenting with a urethral catheter.

In type III: 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.

Male External Genital injuries

- Penile fracture during intercourse.
- Glans injury during circumcision.
- Penile amputation and injuries.
- Scrotal and testicular injuries. **More in machinery**

Female External Genital injuries

Managed by Gynecologists unless urethra is involved.

SUMMARY

1. Hematuria:

Causes varies according to ; age, symptoms, risk factors for malignancy ,type of hematuria
Thy could be: pre renal , renal ,post renal so Hx is important , we should ask about: age ,
Residency, Duration , occupation , pain , timing , color, clot and shape of it, trauma ,
associated symptoms , History of: bleeding disorders, SC, TB, Bilharzias & stone disease ,
family Hx , drugs, colored intake and smoking.

Single most important imaging method is CT urography

2. renal colic :

The most common urological emergency and one of the most common differentials
associated with acute abdomen

Sudden onset of severe pain in the flank, colicky, Associated with nausea/vomiting
usually radiate so the location of the pain is not a good indicator of the location of the stone
e.g : it may radiate to the testicle

Patient is not comfortable and might be rolling around .

It should be Differentiated from Radiculitis

Ct without contrast is the module of choice in investigation in an emergency bcuz of Greater
specificity and sensitivity and Can identify other non-stone causes of flank pain , while MRI is
used in pregnants only bcuz it's time consuming although it is accurate.

95% of stones measuring 5 mm or less will pass on their own and surgery is indicated To
relieve obstruction or remove the stone e.g: pain doesn't respond to analgesics , associated
fever, impairment in renal function , obstruction exceed 4 wks , Personal or occupational
reasons.

3. acute retention:

painful , BPE is the most common cause in male "usually >40" , while iatrogenic in female

4. chronic retention:

painless, gradual , they present with dribbling, overflow incontinence ,palpable bladder

5. torsion of the cord : which is the most serious complication of acute scrotum

True surgical emergency of the highest order that is common among teenagers
irreversible ischemic injury after 4 hrs , and duration of torsion increases the possibility of
testicular salvage decreases , they present with acute pain , nausea ,vomiting, without
dysuria . Referred to the ipsilateral lower quadrant of the abdomen and majority have
previous episode. pediatrics comes with atypical symptoms (like vomiting) .

P/E: affected testis is high and laying transverse , tender ,large, edema, Absent cremasteric
reflex, Elevation of the scrotum causes more pain

color Doppler US is the Investigation of choice and surgical exploration is Diagnostic and
therapeutic.

6. epididymo-orchitis : which is most common cause of acute scrotum

Dysuria, Localized epididymal tenderness , bacteruria in urine, Cremasteric reflex is present
AVOID urethral instrumentation to reduce risk of more infection

7. priapism:

In most cases of sickle cell disease, priapism is the first symptom to appear.

Causes :Primary (idiopathic) in 30-50% or secondary : Drugs, trauma, neurological
hematological disease, malignancies

Questions

- 1) A 12 years old boy presented to the ER department with sudden onset of sever testicular pain with no history of trauma and no fever. What is the most likely diagnosis?
 - a. Hydrocele
 - b. Testicular Torsion
 - c. TB epididymitis
 - d. Varicocele
- 2) If the diagnosis is testicular torsion how would you further proceed with your work up?
 - a. Take the patient to CT scan
 - b. Give the patient analgesia and ask him to return to you in 3 days
 - c. Take the patient to OR immediately for surgical exploration
 - d. Administer antibiotics as testicular torsion is an infectious emergency
- 3) A 25 year old male presented to ER in a stable condition after a motor vehicle accident. He complains of left flank pain. You suspect renal injury. Which ONE of the following would be the best test to investigate renal injury?
 - a. CT scan Urography
 - b. Intravenous urography (IVU)
 - c. MRI
 - d. Renal Ultrasound
- 4) Which of the following is an indication for a surgical intervention in ureteric stones?
 - a. Gross hematuria
 - b. If the stones is 6 millimetre in diameter
 - c. Impaired renal function test due to obstruction
 - d. Stone in distal ureter



Answers:

1st Questions: B

2nd Questions: C

3rd Questions: A

4th Questions: C