Emergency in Urology

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Emergency in Urology:

- Require rapid diagnosis and immediate treatment.
- Compared to other surgical fields there are relatively few Urological Emergencies
- **Classification :**
  - **Non-Traumatic:**
    - Hematuria
    - Renal Colic
    - Urinary Retention
    - Acute Scrotum
    - Priapism
  - **Traumatic:**
    - Renal Trauma
    - Ureteral Injury
    - Bladder Trauma
    - Urethral Injury
    - External Genital Injury

First: Non- traumatic urological emergencies

1- **Hematuria** (one of the most common presentation)

a. Defined as Blood in the Urine

b. Types:

i. **Gross (Visible, Clinical):** up to 40% is malignancy

1. **emergency or urgent**
2. 1 ml of blood in 1 liter of urine is visible for the patients

ii. **Microscopic (non visible, not clinical) " non-urgent "**

1. 3 or more RBCS/High power, in 2 out of 3 properly collected samples

c. Causes: varies according to:

i. Patient Age

ii. Symptomatic or Asymptomatic

iii. The existence of risk factors for malignancy

iv. The type: Gross or Microscopic

d. Could be:

i. Pre renal (systemic: SLE, hematology disease : sickle cell disease, hemophilia, anticoagulant drugs)

ii. Renal (tumor either benign or malignant both cause bleeding in kidney , renal stasis, stone, TB in kidney , glomerulonephritis)

iii. Post renal (tumor in bladder or ureter, Bilharzias, prostate "benign or malignant" , urethral problem *polyp, stricture, tumor*)

e. History: (very imp. help in DDx)

i. Age (not known to find transitional cell carcinoma in children), Residency (Bilharzias in Jeizan),Duration, Occupation (Factories),Painless(tumor especially urothelial tumor most commonly urothelial tumor is bladder tumor and most common bladder tumor is transitional cell tumor ,RF of urothelial tumor: smoker , above 40, LUTS irritation , radiation to renal pelvis or pelvis, has Bilharzias>hematuria in this pt more

is due tumor) or painful(stones ,UTI, trauma, renal vein thrombosis) ,Timing of hematuria(help to recognize the site of bleeding: initial : urethra ,terminal: bladder neck , trigone of bladder, total: rest of bladder and Upper tract), Amount of bleeding ,Clots and shape of clots ,Trauma ,Bleeding from other sites

ii. Associated Symptoms urinary and Systemic

iii. Bleeding disorders, SC, TB, Bilharzias & stone disease ,Family History of Malignancy or hematological disorders ,Drugs

iv. Colored food or drinks.

v. Smoking!! : (Doctor said asking about smoking is very crucial because it's known to be a risk factor for bladder carcinoma especially In transitional tumor, Renal cell cancer)

f. Management: Gross hematuria mandate full work up.

i. Work Up:

1. History
2. *P/E= usually not much signs*
3. *Investigations.*
   a. *Single most important imaging method is CTU!*
4. *3 ways urethral catheter and bladder wash out for heavy bleeding.*
5. *Treat according to the cause.*

2- Renal colic:

a. Important points:

i. The commonest urologic emergency. (most presentation especially in our area "SA" we daily see these pts)

ii. One of the commonest causes of the "Acute Abdomen".

iii. Sudden onset of severe pain in the flank

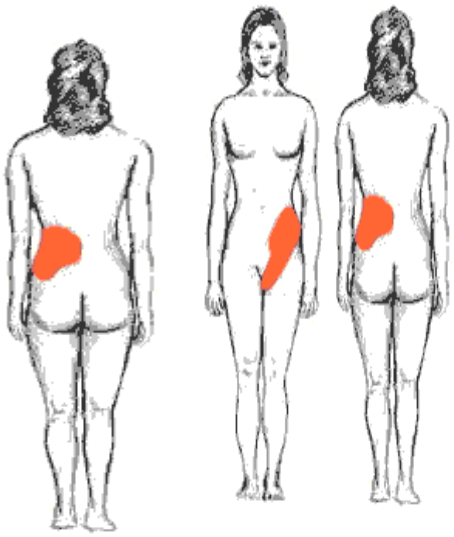
b. Pain:

i. sudden onset, intermittent , no aggravating factor, Reliving factor analgesia.

ii. colicky in nature

iii. Radiates

-kidney & upper ureter innervations from dermatome T7,8 and 9 , in men radiate to testicle "b\c embryological they originate from the same side then the testicle descend so get the same blood & nerve supply. (some pt. come with referral pain in testicular then you find the problem is upper ureter obstruction)



-mid ureter dermatome T 10 to bowel, radiate to iliac fossa "when it is in the rt. Side confused with appendicitis)

-distal ureter (T12) → to trigonal bladder, posterior urethra, scrotal skin, labia majora and lower abdomen "usually pain radiate to scrotum)

iv. May change in location, from the flank to the groin, (the location of the pain does not provide a good indication of the position of the stone)

(stone in kidney, not that moving and big in size could give taught aching pain)

v. The patient cannot get comfortable, and may rolled around
vi. Associated with nausea / Vomiting (due to the severity of pain)
vii. Ureteric stones (sudden severe pain)appear with urinary symptoms and suprapubic pain *pain of renal colic among 3 most painfull condition that might affect human: MI liver pain and uretric pain "pt hurry up to the hospital seeking help".

c. Differential diagnosis:
   i. Rediculitis most confused with it (pseudo-renal) (MSK pain, common form of radiculitis is sciatica, irritation intercostal nerve T7,8,9)
      1. The pain is aggravated by mobility and movement, unlike renal stones that are relieved by movement
      2. Radiates to lower limb
      3. In the history : always presence of back pain and predisposed mobility (someone who carried something heavy)
   ii. Leaking abdominal aortic aneurysms
   iii. Pneumonia
   iv. Myocardial infarction
   v. Ovarian pathology (e.g., twisted ovarian cyst)
   vi. Acute appendicitis (pain aggravated by movement b\c of peritoneal retention so pt. don't move around)
   vii. Testicular torsion
   viii. Inflammatory bowel disease (Crohn's, ulcerative colitis)
   ix. Diverticulitis
   x. Ectopic pregnancy
   xi. Burst (perforated) peptic ulcer
   xii. Bowel obstruction
d. Work Up:
   i. History
   ii. Examination: patient wants to move around, in an attempt to find a comfortable position. Helps in differentiating from appendicitis.
   iii. +/- Fever (supradialysis infection)
   iv. Pregnancy test
   v. MSU: Mid Stream Urine (find microscopic hematuria)
   vi. U&E (urine & electrolyte help to assess renal function)
e. Radiological investigations
   i. Please note that the imaging module of choice is CTU without contrast!
   - b\c you can see other problem in other organ "not like IVU , don't need contrast contrast could lead to renal impairment as complication and also need the dr. to be there if there is any problem", fast "no power vibration, finishing the test in 5 min, easy to read !
   -(shadow of stone is very obvious " renal colic→shadow above the psoas ms. →ureteric stone)

ii. Modules:
    1. KUB: kidney, ureter and bladder X-Ray (read bone,skeletal,soft tissue of kidney,psoas ms.,site of kidney, ureter & bladder if any radiopaque it could be stone, "also in pic. Shadow could be upper ureteric stone")
    2. RUS: Renal Ultrasound
       (not good tool b/c u can't see any stones in ureter+ not anatomical ,not good to investigate for stones *hyperechoic + acoustic shadow*
    3. IVU: intravenous urogram (take plane film→inject contrast→take immediate and late film to see ureter ,bladder)
    4. Helical CTU:
        a. *Greater specificity (95%) and sensitivity (97%) for diagnosing ureteric stones*
        b. *Can identify other, non-stone causes of flank pain.*
        c. *No need for contrast administration.*
        d. *Faster, taking just a few minutes*
        e. *the cost of CTU is equivalent to that of IVU*

    5. MRI:
        a. very accurate way of determining whether or not a stone is present in the ureters
        b. Time consuming
        c. Expensive (not available in all hospital)
        d. For pregnant ladies (no radiation)
           -noisy to pts.

iii. In summary:
    1. CTU is the imaging module of choice in the suspicion of emergency renal colic
    2. MRI is an accurate method for ureteric stones
    3. MRI is used for pregnant ladies, because its time consuming
iv. Management:
    1. Medical:
        a. Pain relief (remember it is one of the most 3 painful condition so you have to relief the pt. pain)
            i. *NSAIDs*
                1. *Intramuscular or intravenous injection, by mouth, or per rectum(profen)*
            ii. *+/- Opiate analgesics (pethidine or morphine) "if NSAIDs Not responding"* .
        b. Hyper hydration (imp.)
        c. '**watchful waiting**' with analgesic supplements
            i. *95% of stones measuring 5mm or less pass spontaneously (the smaller the stone the greater to have ability to pass)*
    2. Surgical:
        a. When to intervene surgically?
            i. To Relieve Obstruction and/or Remove the stone

ii. Pain that fails to respond to analgesics.
iii. Associated fever(you have to drain the kidney b\c fever mean pyelonephritis).
iv. Renal function is impaired because of the stone →uremia (solitary kidney obstructed by a stone, bilateral ureteric stones)
v. Obstruction unrelieved for >4 weeks : More than 4 weeks of obstruction will cause necrosis (kidney can stand obstruction and will be functioning only for 4 weeks, more than that it will dead)
vi. Personal or occupational reasons: Like doctors and pilots

3. Surgical intervention:
    a. Temporary relief of the obstruction:
        i. *Insertion of a JJ stent (from renal pelvis to bladder) OR percutaneous nephrostomy tube* (percutaneously to kidney)
4. Definitive treatment:
    a. Extracorporeal Shockwaves Lithotripsy (ESWL).
    b. percutaneous nephrolithotomy (PCNL) (pass needle to stone to dilate with nephroscopy)
    c. Ureteroscopy (URS) : commonly known as laser
    d. Laparoscopic extraction rarely
    e. Open Surgery: very limited nowadays

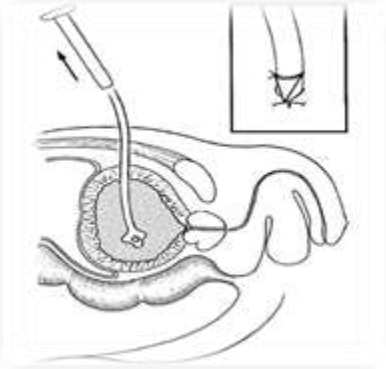
3- Urinary retention: (strange variation in women !)

a. Acute Urinary Retention:

i. Painful inability to void, with relief of pain following drainage of the bladder by catheterization.
- One of the means of torture in intelligence they ligate there organ and give them tea and other things → urinary retention→very painfull : (

ii. Causes: more in male than female.

1. Men:
    a. *Most common cause: Benign prostatic enlargement (BPE) due to BPH (>40 yrs old)* as age of 60 , 3/10 has retention b/c of prostate , age of 90 7/10.
    b. *Carcinoma of the prostate*
    c. *Urethral stricture*
    d. *Prostatic abscess*
2. Women
    a. *Pelvic prolapse (cystocoele, rectocoele, uterine)*
    b. *Urethral stricture;*
    c. *Urethral diverticulum;*
    d. *Post surgery for 'stress' incontinence*
    e. *pelvic masses (e.g., ovarian masses)*



iii. Initial Management

1. Urethral catheterization (imp. To give adequate analgesia especially in children & adult if feeling pain- put anesthetic in urethra wait 4-5 min- try to use catheter gently)
2. Suprapubic catheter (SPC) pass it directly to bladder -some time use it if there is urethral stricture -

iv. Late Management: Treating the underlying cause

b. Chronic Urinary Retention

i. Obstruction develops slowly, the bladder is distended (stretched) very gradually over weeks/months (Pain not a feature)

ii. Sometimes presents with hydronephrosis and renal failure

iii. Usually associated with

1. *Reduced renal function.*
2. *Upper tract dilatation*

iv. Presentation:

1. *Urinary dribbling*
2. *Overflow incontinence (vesicle pressure exceed the pessure In urethra)*
3. *Palpable Bladder (with no pain)*

v. Management

1. *Treatment is directed to renal support(hyperkalemia).*
2. *Bladder drainage under slow rate to avoid sudden decompression > > > hematuria.*
3. *Late treatment of cause. solution is more difficult in urinary retention caused by periphral neuropathy which cause bladder dystrophy .*

4- Acute Scrotum

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

i. Acute scrotum is also known as scrotal pain/ testicular pain

b. *Deferantial diagnoses*

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)

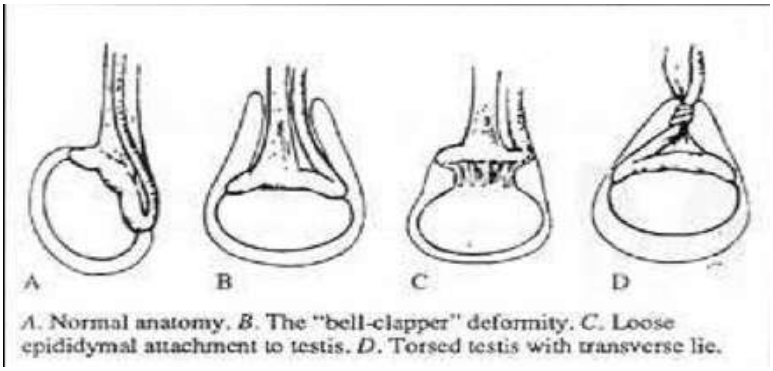
1. Torsion of the spermatic cord is the most serious

2. Epididymitis is the most common

Torsion of the Spermatic Cord

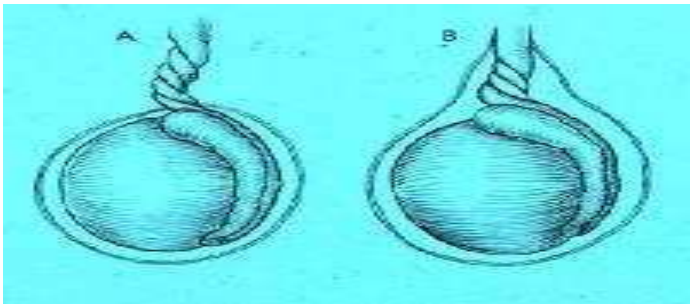
i. Points:
   1. *Common among teenagers (12-18) years*
      a. *Young patient presents with acute scrotum: think torsion!*
   2. *Possible in children and neonates (some cases reported in utero)*
   3. *Unlikely after the age of 25 years*
   4. *True surgical emergency of the highest order*
   5. *Irreversible ischemic injury to the testicular parenchyma may begin as soon as 4 hours (twist →occlusion to VR→ swollen → blockage to arterial supply→ischemia start in 4 hrs) "the longer the time of twist the higher posibility of ischemia"*
   6. *Testicular salvage ↓ as duration of torsion ↑*

ii. Anatomical Variations (predisposing factor):
   1. (a) Normal (tunica vaginalis "layer surrounding testis,embryological it is part of the peritoneum" fixed by 3D, at side of Epididymis it will be attached)
   2. (b) The "Bell-Clapper"مثل جرس المدرسة Deformity (tunica vaginalis surrounding all over testis → so testicle very loose)
   3. (c)Loose Epididymal attatchment to testis (loose mesentry b\w epididymis & testis)
   4. (d)Torsed Testis with transverse "or oblique" lie (lie of testis normally is logtudinal)



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

iii. Types (not imp.):
   1. (A) Extra-Vaginal
   2. (b) Intra-Vaginal



iv. Presentation

1. *Acute onset of scrotal pain. Most Important!-* "**sharp and sever**" most of the pts complain of "testicular pain "comes and goes away"b\c of the Torsion and detorsin !
2. Majority with history of prior episodes of severe, self-limited scrotal pain and swelling
3. Nausea/Vomiting due to severe pain
4. Referred to the ipsilateral lower quadrant of the abdomen.
5. Children might not complain of testicular pain, sometimes present with abdominal pain –any child complain of vomiting and abd pain we should expose the gential area " childeren diffrent in presentation of torsion of the spermatic cord " *torsion is a congenital diseaes but happen later on maybe with moving or other causes !

*Doctor mentioned this 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.

6. Dysuria and other bladder symptoms are usually absent. b\c there is no infection

v. Physical exam:

1. The affected testis is **high riding** transverse orientation –higher than normal and swellen "
2. Acute secondry hydrocele or massive scrotal **edema**
3. Cremasteric reflex is absent.
4. Tender and larger than other side- child do not allow you th touch it !
5. Elevation of the scrotum causes more pain- more pain b\c of the ischemia. more ischemia more pain
6. Scrotal edema
7. Very painful to touch

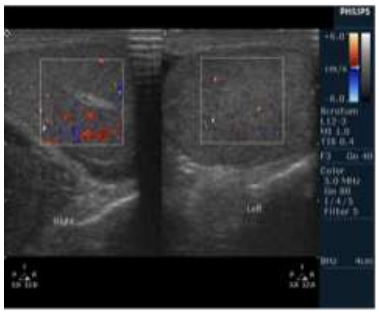
vi. Adjunctive tests:

1. To aid in differential diagnosis of the acute scrotum.
2. To confirm the absence of torsion of the cord.
3. sound Doppler examination of the cord and testis
    a. High false-positive and false- negative

Usually we do not go in the investigation it "ER"case we send him directly to the "OR "at least we sure 99% it not torsion! b\c the organ threatening receiving even without CBC.
May do Doppler scan in OR

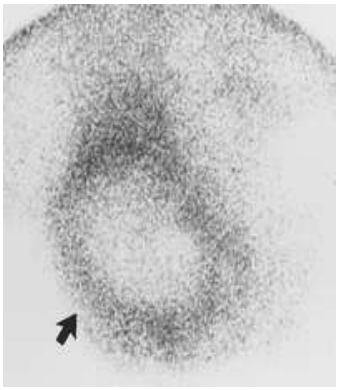
vii. **Color** Doppler **ultrasound: (investigation of choice)**

1. Assessment of anatomy and determining the presence or absence of blood flow.- to see the arterial blood supply of the testis –pic : in the left there is abcent of blood supply , secondry hydrocele without arterial flow
    a. Sensitivity: 88.9% specificity of 98.8%
    b. Operator dependent.



How to know it dead or not ? Needle prick- if there is no blood coming out or black it dead! White red- good

To the "OR "even the pt late with dead testis .b\c our aim to save the other one .already we loss the first one .the 2nd have the same



viii. Radionuclide imaging :photopenic area
   1. Assessment of testicular blood flow.
   2. A sensitivity of 90%, and a specificity of 89%.
   3. False impression from hyperemia of scrotal wall.
   4. Not helpful in Hydrocele and Hematoma

ix. Surgical exploration: > when it miss it after 3,4 dayes
   1. A scrotal incision
   2. The affected side should be examined first
   3. The cord should be detorsed.
   4. Testes with marginal viability should be placed in warm and re-examined after several minutes.
   5. A necrotic testis should be removed- it better to the pt to reduce the recovery period
   6. If the testis is to be preserved, it should be fixed
   7. The contra-lateral testis must be fixed to prevent subsequent torsion

c. **Epididymo-orchitis** –very common in saudia arabia
   i. Presentation:
      1. Indolent process. (causing little or no pain)-it gradully not sudden ,not sever from the start .
      2. Scrotal swelling, erythema, and pain.
      3. Dysuria and fever is more common-pts history with STD,UTI .rare with hematological case or "with abd pain in children"
      4. In saudi arabia Might be a presentation of brucella
   ii. Physical exam:
      1. localized epididymal tenderness, a swollen and tender epididymis, or a massively swollen hemi-scrotum with absence of landmarks.
      2. Cremasteric reflex should be present (absent in torsion of spermatic cord)
   iii. Urine:
      1. pyuria, bacteriuria, or a positive urine culture
   iv. Management:
      1. Bed rest for 1 to 3 days then relative restriction
      2. Scrotal elevation, the use of an athletic supporter
      3. parenteral antibiotic therapy should be instituted when UTI is documented or suspected. Or oral antibotic
      4. Urethral instrumentation should be avoided

      When there is acute problem treat the organism first !

5- Priapism

a. Persistent erection of the penis for more than*4 hours that is not related or* accompanied by sexual desire

b. 2 Types:

   i. Ischemic (veno-occlusive, low flow) (most common)

      1. Due to hematological disease" sickle cell "imp", malignant infiltration of the corpora cavernosa with malignant disease, or drugs. Ex:" Prostaglanden injection"

         a. Thrombosis of the venous system causes congestion/engorgment and this leads to Priapism

      2. Painful

   ii. *Non-ischemic (arterial, high flow).*

      1. *Due to perineal trauma, which creates an arterio-venous fistula.*
      2. *Painless*

   iii. *Persistance of priapism will cause clotting this will lead to healing by fibrosis in the corpora, eventually this will damage it and the patient will lose the ability of erection.*

c. Causes:

   i. Primary (Idiopathic) : 30% - 50 %

   ii. Secondary:

      1. *Drugs*
      2. *Trauma* in prenum
      3. *Neurological*
      4. *Hematological disease* like sickle cell
      5. *Tumors* in pelvic
      6. *Miscellaneous*

d. The diagnosis:

   i. Usually obvious from the history

      1. Duration of erection >4 hours
      2. Is it painful or not?.
      3. Previous history and treatment of priapism
      4. Identify any predisposing factors and underlying cause

e. Examination:

   i. Erect, tender penis (in low- flow)

   ii. Characteristically the corpora cavernosa are rigid and the glans is flaccid.

   iii. Abdomen for evidence of malignant disease

   iv. DRE (Digital rectal exam) : to examine the prostate and check anal tone. For nrurological D. – also examin lymph node if there is malignancy.

f. Investigations:

   i. CBC (white cell count and differential, reticulocyte count)

   ii. Hemoglobin electrophoresis for sickle cell test

   iii. Urinalysis including urine toxicology "drug"

   iv. Blood gases taken from either corpora,imp!!

      1. **low-flow** (dark blood; pH <7.25 (acidosis); pO2 <30mmHg (hypoxia); pCO2 >60mmHg (hypercapnia))>ischemic type *vaso-occlusive*!

We know it from the history do not go to the investigation to diagnose it

2. **high-flow** (bright red blood similar to arterial blood at room temperature; pH = 7.4; pO2 >90mmHg; pCO2 <40mmHg) > arterio-venous fistula!

v. Color flow duplex ultrasonography in cavernosal arteries:
   1. *Ischemic (inflow low or nonexistent)*
   2. *Non-ischemic (inflow normal to high).*

vi. Penile pudendal arteriography in case of trauma " RTA"

g. Treatment: " when it prolong occuslive→ thrombosis→ fibrosis → erectile dysfunction
   i. Depends on the type of priapism.- ischemic is Emeregency
   ii. Conservative treatment should first be tried- to open other channle for blood يطلعوا الدرج
   iii. Medical treatment
      1. Bicarbonate, high o2,cold enema –esp. When pt is sckile "carbonate exfusion "hydration ,oxgnation, then conservation mangment : aspration of the blood
         - Salin wash carbora.
   iv. Surgical treatment.
   v. Treatment of underlying cause

Second: Traumatic Urological Emergencies:

Classification:

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

1. Renal Injury :

a. The kidneys relatively protected" by ribs, mascular wall, spinsl cord" from traumatic injuries , Considerable degree of force is usually required to injure a kidney. Usually consider injury of the other organ.

b. Mechanisms and cause:
   i. Blunt
      1. direct blow or acceleration/ deceleration (road traffic accidents, falls from a height, fall onto flank)
   ii. Penetrating
      1. knives, gunshots, iatrogenic, e.g., percutaneous nephrolithotomy (PCNL)

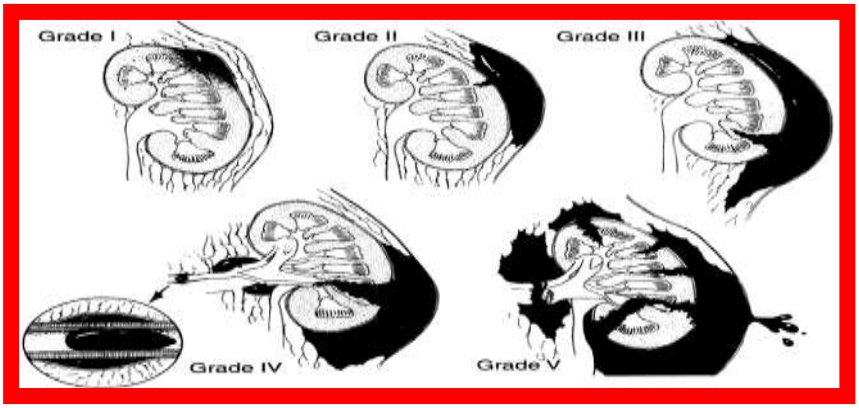
c. Renal Imaging:
   i. Imaging module of choice: Contrast-enhanced CT
   ii. Indications for renal imaging:
      1. Macroscopic hematuria
      2. Penetrating chest, flank, and abdominal wounds
      3. Microscopic [>5 red blood cells (RBCs) per high powered field] or dipstick
      4. hematuria a hypotensive patient (SBP <90mmHg)
      5. A history of a rapid acceleration or deceleration
      6. Any child with microscopic or dipstick hematuria who has sustained trauma – even < 5 RBC.

iii. What module to choose?

1. IVU: to see the other kidney it function or not .
    a. replaced by the contrast- enhanced CT
    b. On-table IVU: if patient is transferred immediately to the operating theatre without having had a CT scan and a retroperitoneal hematoma is found
2. Spiral non contrast CT: does not allow accurate staging
3. Renal US: if we want to treat pt with hematoma conservitive and want to do follow up , So First is contrast CT and to follow up U/s
    a. Advantages:
        i. can certainly establish the presence of two kidneys
        ii. the presence of a retroperitoneal hematoma
        iii. power Doppler can identify the presence of blood flow in the renal vessels
    b. *Disadvantages:*
        i. 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.
4. **Contrast-enhanced CT:**
    a. *the imaging study of choice*- we can see other injrey in the abdomin
    b. *accurate, rapid, images other intra-abdominal structures*

iv. Staging:

1. Grade I: flank pain + heamturia with or without pericapsular hematoma, but no evident kindey damage
2. Grade II: injury to the cortex only of 1cm or less with hematoma
3. Grade III: injury to the cortex and medulla without reaching the collecting system with hematoma (more than 1cm)
4. Grade IV: injury reaching to the collecting system OR thrombosis to the renal vessels
    a. On IVU there will be extravasation of contrast and decreased filling
5. Grade V: shattered kidney completly



v. Management:

1. Conservative:
    a. Over 95% of blunt injuries
    b. 50% of renal stab injuries and 25% of renal gunshot wounds (specialized center).
    c. Include:
        i. Wide Bore IV line.
        ii. IV antibiotics.
        iii. Bed rest
        iv. serial CBC (HCT)
        v. Follow up US &/or CT>don't like a lot of CT.
2. Surgical exploration (indications for exploration) :
    a. Persistent bleeding (persistent tachycardia and/or hypotension failing to respond to appropriate fluid and blood replacement
    b. Expanding peri-renal hematoma (again the patient will show signs of continued bleeding)
    c. Pulsatile " active bleeding" peri-renal hematoma

Esp. with children and without hypertensive or chronic Disease→heal completely .

Under 90 systolic pr and do not response to blood transfusion →exploration

2. Ureteral Injuries

a. The ureters are protected from external trauma by surrounding bony structures, muscles and other organs, " more protect it than kidney small structer and rare to affect by trauma" and with other organ injury "

mechanisms and causes:

b. External Trauma:
    i. Rare
    ii. Severe force is required
    iii. Blunt or penetrating.
        1. Blunt external trauma severe enough to injure the ureters will usually be associated with multiple other injuries.
    iv. Knife or bullet wound to the abdomen or chest may damage the ureter, as well as other organs
c. Internal Trauma:- the most
    i. Iatrogenic: caused by doctors
    ii. Uncommon, but is more common than external trauma
    iii. Surgery:
        1. Hysterectomy, oophorectomy, and sigmoidcolectomy
        2. Ureteroscopy
        3. Caesarean section
        4. Aortoiliac vascular graft replacement
        5. Laparoscopic
        6. Orthopedic operations
d. Diagnoses: " its more with abdomin surgery"
    i. Requires a high index of suspicion
    ii. Intra-operative

iii. Late:
    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.
    4. Flank pain if the ureter has been ligated
    5. An abdominal mass, representing a urinoma
    6. *Vague abdominal pain*

e. Treatment options: " if you likly after surgery heal probably "
    i. JJ stenting
    ii. Primary closure of partial transaction of the ureter
    iii. Direct ureter to ureter anastomosis
    iv. Re-implantation of the ureter into the bladder using a psoas hitch or a Boari flap
    v. Trans uretero-ureterostomy
    vi. Auto-transplantation of the kidney into the pelvis
    vii. Replacement of the ureter with ileum
    viii. Permanent cutaneous ureterostomy
    ix. Nephrectomy

3. **Bladder Injuries**: it common with Caesarean section injery .
    a. Causes:
        i. Iatrogenic injury (caused by medical treatment or a proccess)
            1. Transurethral resection of bladder tumor (TURBT)
            2. Cystoscopic bladder biopsy
            3. Transurethral resection of prostate (TURP)
            4. Cystolitholapaxy
            5. Caesarean section, especially as an emergency
            6. Total hip replacement (very rare)
        ii. Penetrating trauma to the lower abdomen or back
        iii. Blunt pelvic trauma—in association with pelvic fracture or 'minor' trauma in a drunkard patient
        iv. Rapid deceleration injury seat belt injury with full bladder in the absence of a pelvic fracture or in RTA " seat belt "
        v. Spontaneous rupture after bladder augmentation
    b. Types of perforation:
        i. intra-peritoneal perforation : the peritoneum overlying the bladder, has been breached along with the wall the of the bladder, allowing urine to escape into the peritoneal cavity.
        ii. extra-peritoneal perforation: the peritoneum is intact and urine escapes into the space around the bladder, but not into the peritoneal cavity.

c. Presentation:
   i. Recognized intra-operatively
   ii. The classic triad of symptoms and signs that are suggestive of a bladder rupture : 1)suprapubic pain and tenderness 2)difficulty or inability in passing urine 3)hematuria
d. Management: extra - consestive
   i. Extra-peritoneal:
      1. Bladder drainage +++++
      2. Open repair +++
   ii. Intra peritoneal :
   open repair…why?
      1. Unlikely to heal spontaneously.
      2. Usually large
      3. Leakage causes peritonitis
      4. Associated other organ injury.

4. Urethral injuries:

a. Anterior urethral injuries
   i. Rare
   ii. Mechanism:
      1. The majority is a result of a straddle injury in boys or men.- when child jumps with his legs not close to each other .
      2. Direct injuries to the penis
      3. Penile fractures
      4. Inflating a catheter balloon in the anterior urethra
      5. Penetrating injuries by gunshot wounds.
   iii. Symptoms and signs:
      1. Blood at the end of the penis
      2. Difficulty in passing urine
      3. Frank hematuria
      4. Hematoma may around the site of the rupture
      5. Penile swelling
   iv. Diagnosis:
      1. Retrograde urethrography
         a. Contusion: no extravasation of contrast
         b. Partial rupture : extravasation of contrast, with contrast also present in the bladder
         c. Complete disruption: no filling of the posterior urethra or bladder

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

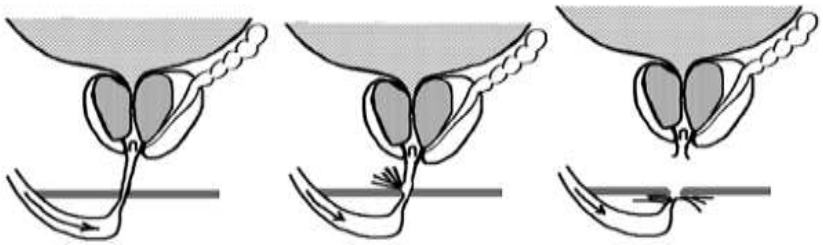
Less filling means greater damage

   v. Management:
      1. Contusion – do not do any thing
         a. A small-gauge urethral catheter for one week
      2. Partial Rupture of Anterior Urethra
         a. No urethral catheterization!!!!

b. Majority can be managed by suprapubic urinary diversion for one week
c. Penetrating partial disruption (e.g., knife, gunshot wound), primary (immediate) repair

3. Complete Rupture of Anterior Urethra-
    a. patient is unstable: a suprapubic catheter.
    b. patient is stable: the urethra may either be immediately repaired or a suprapubic catheter
4. Penetrating Anterior Urethral Injuries
    a. generally managed by surgical debridement and repair

b. Posterior urethral injuries
    i. Great majority of posterior urethral injuries occur in association with pelvic fractures, 10% to 20% have an associated bladder rupture
    ii. Signs:
        1. Blood at the meatus, gross hematuria, and perineal or scrotal bruising.
        2. High-riding prostate when examining by Digital rectal exam
    iii. **Classification of posterior urethral injuries**
        1. type I:(rare) *stretch injury with intact urethra*
        2. type II : (25%) *partial tear but some continuity remains*
        3. type III:(75%) *complete tear with no evidence of continuity*
        4. In women, partial rupture at the anterior position is the most common urethral injury associated with pelvic fracture



    iv. Management:
        1. Stretch injury (type I) and incomplete urethral tears(type II) are best treated by stenting with a urethral catheter
        2. Type III
            a. Patient is at varying risk of urethral stricture, urinary incontinence, and erectile dysfunction (ED)
            b. Initial management with suprapubic *cystotomy and attempting primary repair at 7 to 10 days after injury.*

5. External gential injuries:

a. Penile Fracture – during sexual intrcorse .
b. Glans Injury-doing Circumcision by non medical people.
c. Penile amputation and injury
d. Scrotal Injury
e. Female External genitalia injury – in some sports , crime