Genito-Urinary Trauma

Introduction

- About 10% of all injuries seen in the emergency room involve the genitourinary system to some extent.
- Genito-urinary trauma is seen in both sexes and is more common in males.
- It is very important to recognize these injuries early and to manage them properly.
- Early detection and proper management of these injuries can reduce complications and improve outcome and in some cases can save organs or even save life.

Introduction – kidney trauma

- The kidney is the most commonly injured organ in the genito-urinary system.
- Renal trauma is seen in up to 5% of all trauma cases, and in 10% of all abdominal trauma cases.
- Blunt trauma directly to the abdomen, flank, or back is the most common mechanism, accounting for 80–85% of all renal injuries.

Introduction – ureteral injury

- Ureteral trauma is relatively rare.
- Mostly due to iatrogenic injuries, penetrating gunshot wounds – both in military and civilian settings.
- Rapid deceleration accidents may avulse the ureter from the renal pelvis.

Introduction – bladder injury

- Traumatic bladder injuries are usually due to blunt motor vehicle accidents causes.
- Associated with pelvic fracture (80%)
- About 15% of all pelvic fractures are associated with concomitant bladder or urethral injuries.
- May also be a result of iatrogenic trauma.

Introduction – urethral injuries

- Urethral injuries are uncommon and occur most often in men.
- usually associated with pelvic fractures or straddle type falls.
- Injuries to the anterior urethra are caused by trauma during sexual intercourse (**penile fracture**), penetrating trauma, placement of penile constriction bands, and from iatrogenic trauma e.g. endoscopic instruments, catheterization.
- Injuries to the posterior urethra occur with pelvic fractures, mostly as a result of motor vehicle accidents. The male posterior urethra is injured in 4-19% of pelvic fractures, and the female urethra in 0-6% of all pelvic fractures.

Introduction – genital trauma

- Genital trauma is much more common in males due to anatomical considerations and more frequent participation in physical sports, violence and war-fighting.
- Of all genito-urinary injuries, 1/3-2/3rds involve the external genitalia.

Initial evaluation and management

- The first priority is stabilization of the patient and treatment of associated life-threatening injuries.
- The initial treatment should include securing the airway, controlling external bleeding and resuscitation of shock.
- A direct history is obtained from conscious patients.
- Witnesses and emergency personnel can provide valuable information about unconscious or seriously injured patients.
- Physical examination is carried out during the stabilization of the patient.

Initial evaluation and management

- The abdomen and genitalia should be examined for evidence of **contusions** or subcutaneous **hematomas**, which might indicate deeper injuries to the retroperitoneum and pelvic structures.
- Fractures of the **lower ribs** are often associated with renal injuries, and **pelvic fractures** often accompany bladder and urethral injuries.
- Diffuse **abdominal tenderness** is consistent with perforated bowel, free intraperitoneal blood or urine, or retroperitoneal hematoma.
- **Blood at the urethral meatus** in men indicates urethral injury. And here catheterization should not be attempted.
- Microscopic or gross **hematuria** indicates urinary system injury.

Renal trauma

- Although renal trauma can be acutely life-threatening, most injuries can be managed conservatively.
- During the past 20 years, advances in imaging and treatment strategies have decreased the need for surgical intervention and increased renal preservation.
- The kidney is **well protected** by heavy lumbar muscles, vertebral bodies, ribs, and the viscera anteriorly.
- Fractured ribs and transverse vertebral processes may penetrate the renal parenchyma or vasculature.
- Kidneys with existing **pathologic conditions** such as hydronephrosis or malignant tumors are more readily ruptured from mild trauma.

Renal trauma - etiology

- **Blunt trauma** directly to the abdomen, flank, or back is the most common mechanism, accounting for **80–85%** of all renal injuries.
- Trauma may result from **motor vehicle** accidents, **fights, falls, and contact sports**.
- Vehicle collisions at high speed may result in major renal trauma from **rapid deceleration** and cause major vascular injury.
- **Penetrating injuries**: Gunshot and knife wounds cause most penetrating injuries to the kidney. Associated abdominal visceral injuries are present in 80% of renal penetrating wounds.

Renal trauma - clinically

- Pain may be localized to one flank area or over the abdomen.
- There is usually visible evidence of abdominal trauma.
- Retroperitoneal bleeding may cause abdominal distention, ileus, and nausea and vomiting.

Renal trauma - clinically

- Initially, **shock** or signs of a large loss of blood from heavy retroperitoneal bleeding may be noted.
- **Ecchymosis** in the flank or upper quadrants of the abdomen is often noted.
- Lower **rib fractures** are frequently found.
- Diffuse **abdominal tenderness** may be found on palpation; an “acute abdomen” usually indicates free blood in the peritoneal cavity.
- A palpable **mass** may represent a large retroperitoneal hematoma or perhaps urinary extravasation.

Renal trauma - labs

- The best indicators of significant urinary system injury include the presence of microscopic (>5 RBCs/HPF) or gross hematuria and hypotension (systolic blood pressure <90 mm Hg).
- The presence of microscopic hematuria is often characteristic. However, the degree of hematuria and the severity of the renal injury do not consistently correlate.
- The hematocrit may be normal initially, but a drop may be found when serial studies are done.

  This finding represents persistent retroperitoneal bleeding and development of a large retroperitoneal hematoma.

Renal trauma - pathology

- **Lacerations** from blunt trauma usually occur in the transverse plane of the kidney. The mechanism of injury is thought to be force transmitted from the center of the impact to the renal parenchyma.
- In injuries from rapid deceleration, the kidney moves upward or downward, causing sudden stretch on the renal pedicle and sometimes complete or partial **avulsion.**
- Acute **thrombosis** of the renal artery may be caused by an intimal tear from rapid deceleration injuries owing to the sudden stretch.

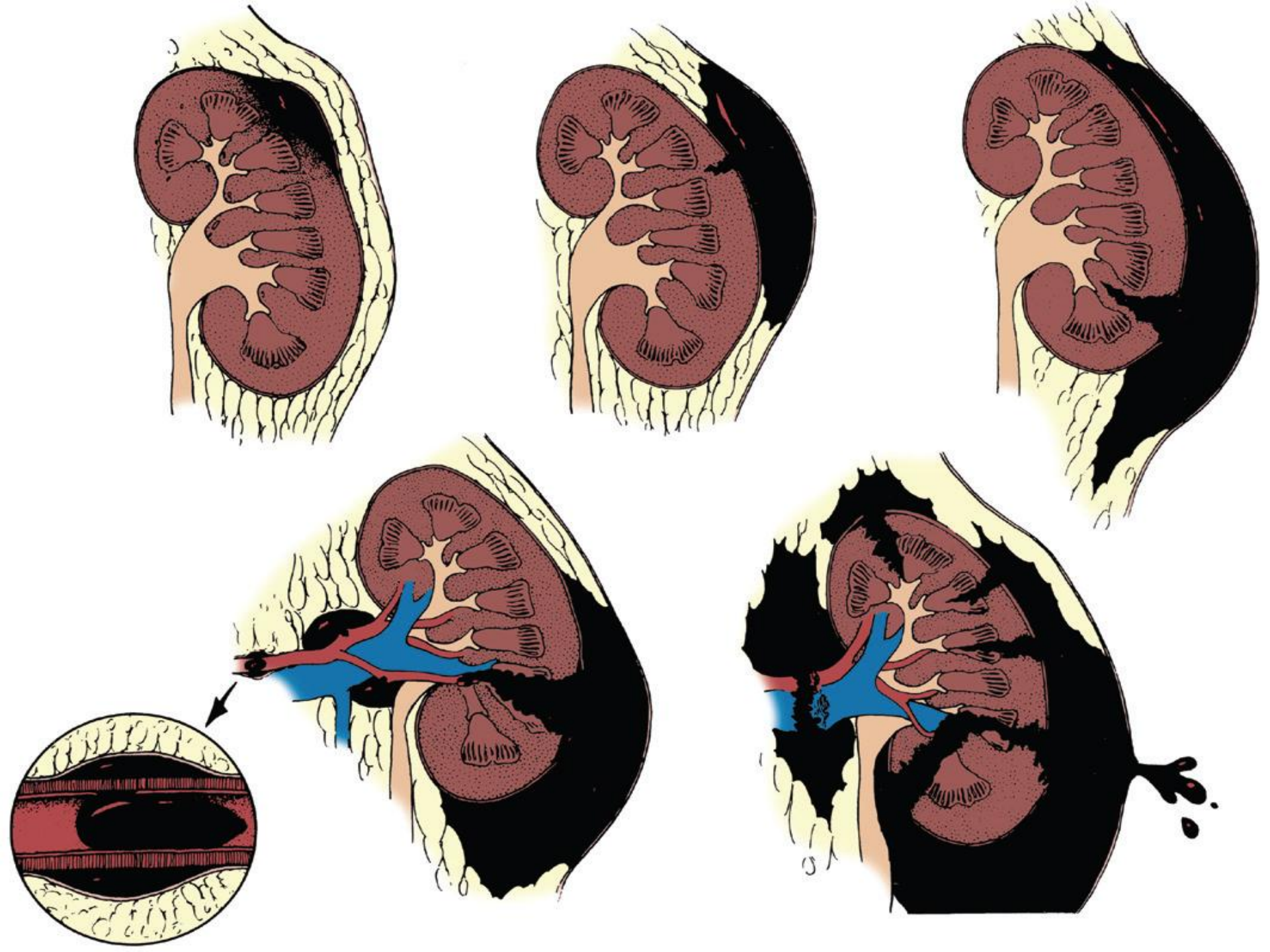
Renal trauma - imaging

Study of choice:

- **CT- scan with IV contrast with delayed phase**

Renal trauma – Grading system

- **GRADE 1:** Contusion or non-expanding subcapsular hematoma. No laceration
- **GRADE 2:** Non-expanding peri-renal hematoma, Cortical laceration < 1 cm deep without extravasation.
- **GRADE 3:** Cortical laceration > 1 cm without urinary extravasation.
- **GRADE 4: Laceration:** through corticomedullary junction into collecting system Or **Vascular:** segmental renal artery or vein injury with contained hematoma, or vessel thrombosis.
- **GRADE 5: Laceration:** shattered kidney. Or **Vascular:** renal pedicle avulsion



Renal trauma – indications for exploration

- hemodynamic instability.
- exploration for associated injuries.
- expanding or pulsatile peri-renal hematoma identified during laparotomy.
- grade 5 vascular injury.

- *Interventional radiology is indicated in patients with active bleeding from renal injury but without other indications for immediate abdominal operation.*

Renal trauma - complications

- Urinoma and abscess formation.
- Hydronephrosis and loss of renal function.
- Arteriovenous fistula
- Renal vascular hypertention (<1% of cases).

Ureteral injuries

- A high index of **suspicion** of ureteral injury should be maintained because the majority of cases are diagnosed late and predispose the patient to pain, infection, and renal function impairment.
- **Extravasation** of contrast material in CT is the hallmark sign of ureteral trauma, and in unclear cases, a retrograde or antegrade urography is required for confirmation.

Ureteral injuries

- Damage to the ureter after external violence is quite *rare*, occurring in less than 4% of all penetrating and less than 1% of all cases of blunt trauma
- These patients often have **significant concomitant injuries** and a devastating degree of mortality that approaches one third

Ureteral injuries

- An unrecognized or mismanaged ureteral injury can lead to significant complications, including:
  - urinoma
  - Abscess
  - ureteral stricture
  - urinary fistula
  - potential loss of an ipsilateral renal unit

Ureteral injuries

Study of choice:

- **Delayed phase of CTscan (with IV contrast)**
- Retrograde ureterogram

Ureteral injuries

- Partial injury can be managed with ureteral **stenting** or urinary diversion by a **nephrostomy.**
- In complete injuries, ureteral **reconstruction** following temporary urinary diversion is required.
- The type of repair procedure depends on the site of the Injury.
- Proximal and mid-ureteral injuries can often be managed by primary **uretero-ureterostomy**, while a distal injury is often treated with ureteral **reimplantation**.

Ureteral injuries

- **Upper ureter:** Uretero-ureterostomy, Transuretero-ureterostomy, Uretero-calycostomy
- **Mid ureter :** Uretero-ureterostomy, Transuretero-ureterostomy, Ureteral reimplantation and a Boari flap
- **Lower ureter:** Ureteral reimplantation, Ureteral reimplantation with a psoas hitch
- **Complete:** Ileal interposition graft, Autotransplantation

Bladder trauma

- Bladder injuries are classified as extraperitoneal, intraperitoneal or combined.

- Cardinal sign: **gross haematuria**.
- Others: abdominal tenderness, inability to void, bruises over the suprapubic region, and abdominal distension (in case of urinary ascites).
- Penetrating bladder injury: entrance and exit wounds in lower abdomen or perineum.

- **Cystography (conventional or CT- cystography)** is the diagnostic tool of choice.

Bladder trauma - treatment

- **Surgical repair (two-layer vesicorraphy)**
- Penetrating injury.
- Blunt intraperitoneal injury.
- Blunt extraperitoneal injury with internal osteosynthetic fixation of pelvic fracture.
- (large) Iatrogenic internal intraperitoneal injury.
- Intra-operative recognized injury.
- In case of bladder neck involvement, bony fragment(s) in the bladder, concomitant rectal injury and/or bladder wall entrapment.

Bladder trauma - treatment

- **Conservative treatment (urinary catheter)**
- Postoperative recognized extraperitoneal perforation.
- Blunt extraperitoneal perforation.
- Iatrogenic internal extraperitoneal perforation.
- Small internal intraperitoneal perforation in absence of ileus and peritonitis. Placement of an intraperitoneal drain is optional.

Urethral Trauma

- Blood at the external urethral meatus is the most common clinical sign, and indicates the need for further diagnostic work up.
- Pain on urination or inability to void may indicate disruption.
- Blood at the vaginal introitus is present in more than 80% of female patients with pelvic fractures and co-existing urethral injuries.
- Rectal examination may reveal a “high riding” prostate. However, this is an unreliable finding.

Urethral Trauma

- **Retrograde urethrography** is the gold standard for evaluating urethral injury and urethral catheterisation should be avoided until the urethra is imaged.
- In an unstable patient, however, an attempt can be made to pass a urethral catheter (gently, by someone with urological experience). If this is not possible, a suprapubic catheter is inserted and a retrograde urethrogram is performed later.

Urethral Trauma

- Anterior urethral injuries are treated by primary urethral repair only if associated with penile fracture or in penetrating wounds.
- Blunt trauma should be treated in the acute management by suprapubic cystosomy or urethral catheterization.
- After the patient has recovered from any associated injuries, and the urethral injury has stabilized, delayed management is used applied 3 to 6 months.
- Short and flimsy strictures are managed by optical urethrotomy or urethral dilatation. Denser strictures require urethral reconstruction.

Urethral Trauma

- Posterior urethral injuries are treated by primary open repair only in stable patients with penetrating wounds.
- In all other cases a suprapubic cystostomy is performed.
- In stable patients with blunt trauma associated with complete urethral rupture an open surgery is only necessary in the acute phase when complicated by bladder neck or rectal injuries.
- In all other cases a suprapubic cystostomy is the appropriate acute management.
- If delayed management is conducted, it consists of endoscopic realignment or delayed urethroplasty.
- Urethral strictures following partial ruptures can be treated by optical urethrotomy.

Genital trauma - Penile fracture

- Usually results from trauma to the erect penis during sexual intercourse or masturbation.
- Sudden cracking or popping sound, pain and immediate detumescence.
- Local swelling of the penile shaft is seen and this may extend to the lower abdominal wall.

Genital trauma - Penile fracture

- In penile fracture, early surgical intervention with closure of the tunica albuginea is recommended.
- Intra-operative flexible cystoscopy is useful to diagnose urethral injury and to further localize tunical damage.
- Conservative management of penile fracture is not recommended.

Genital trauma – scrotal injuries

- If testicular rupture suspected, explore, evacuate clot and any necrotic testicular tubules and close the tunica albuginea.
- In penetrating scrotal injuries, Surgical exploration with conservative debridement of non-viable tissue.
- Primary reconstruction of testis and scrotum can be performed in most cases.

Thank you.