



SOCIETY OF TRAUMA NURSES

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Genitourinary Trauma



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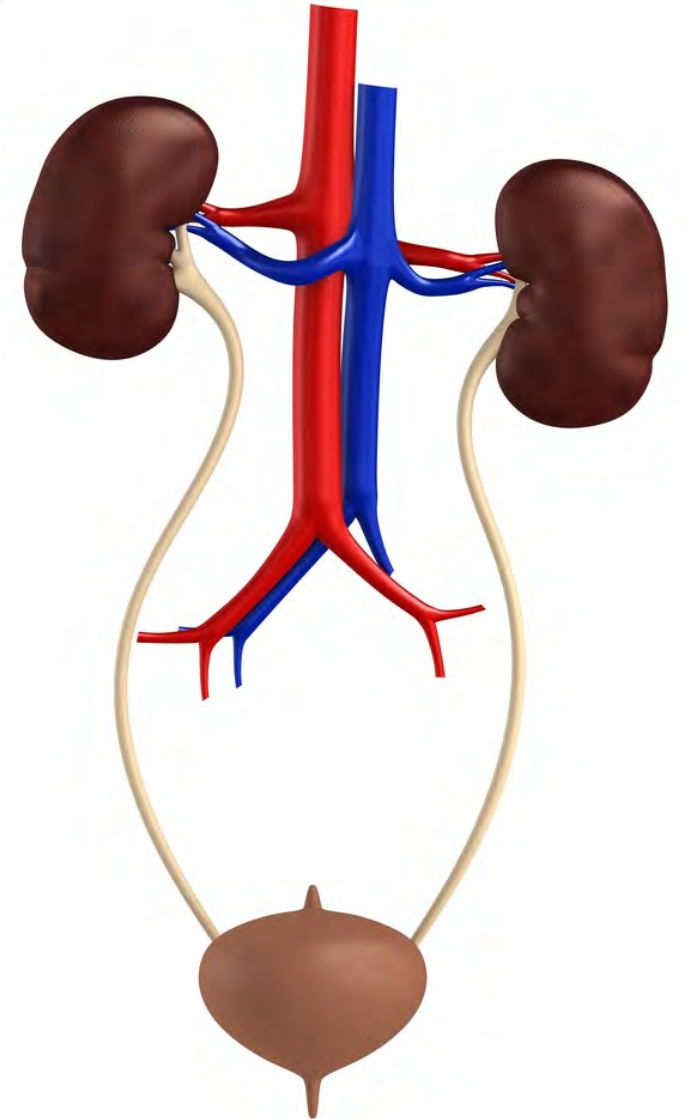
Objectives

At the conclusion of this presentation the participant will be able to:

- Describe the mechanisms of injury for genitourinary (GU) trauma
- Identify the appropriate physical assessment and diagnostic studies for the initial and ongoing assessment of the GU injured patient
- Identify three complications that can occur during the hospitalization of a patient who has sustained a GU injury

GU Epidemiology

- Incidence
 - Accounts for 1-5% of all trauma and up to 10% of abdominal injuries
- Organs affected:
 - Kidney (> 80%)
 - Bladder, urethra (~10% each)
 - Ureters and other organs – rare



GU Epidemiology

Associated Injuries

- Pelvic fractures
- Lower rib fractures
- L-spine TP fracture

Morbidity and Mortality

- Missed or delayed diagnoses
- Multisystem trauma with renal injuries



Mechanisms of Injury

- Blunt mechanism
- Forces
 - Compression forces
 - Shearing forces
 - Deceleration forces
- Sources
 - MVC
 - Falls
 - Assaults
 - Blast
 - Sexual assault



Mechanism of Injury - Blunt

- Suspect renal injury with posterior rib fractures or lumbar vertebral fractures
- Acceleration-Deceleration forces may cause damage to the renal vasculature

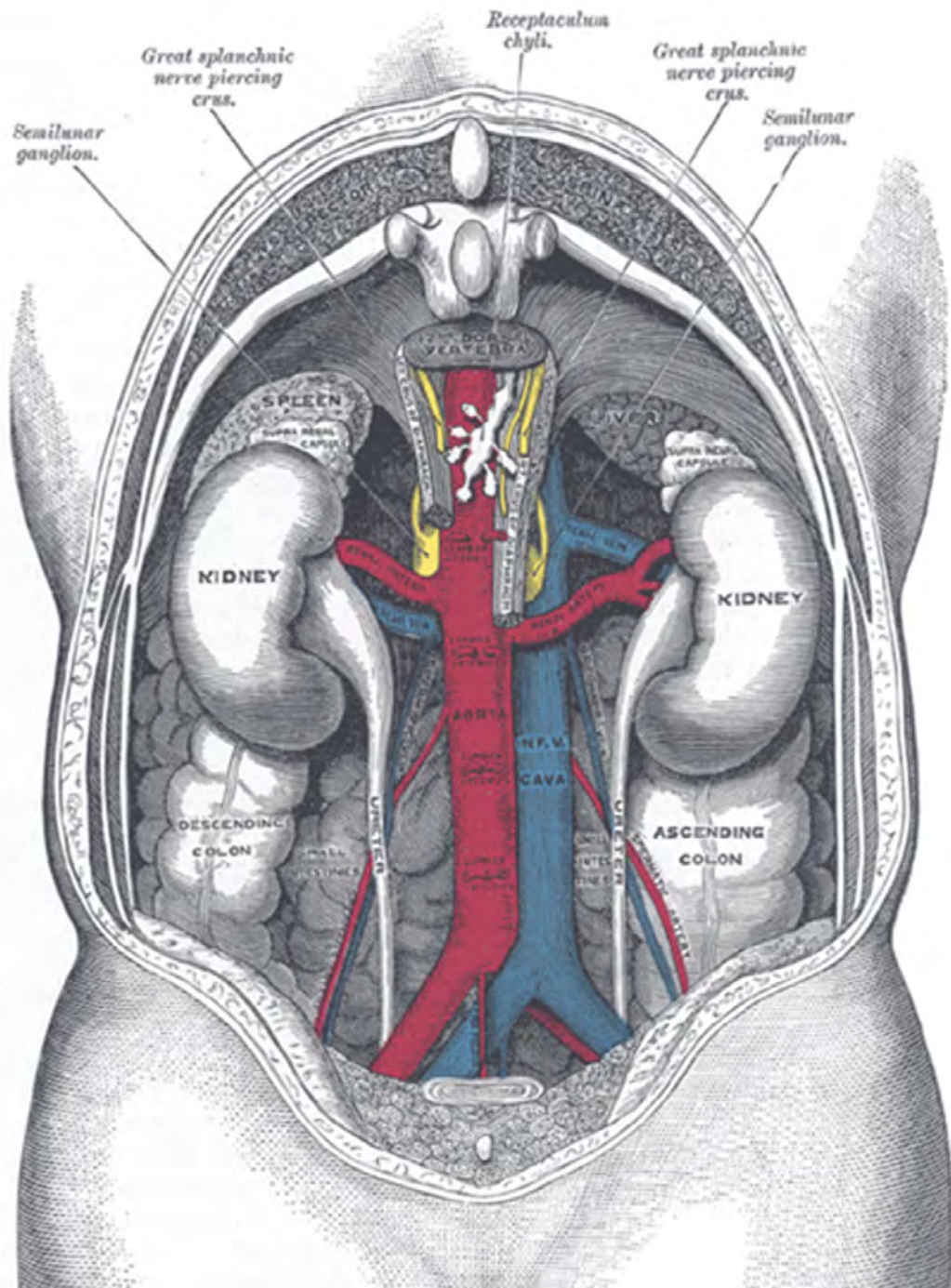




Mechanisms of Injury: Penetrating

- Low velocity
- Medium velocity
- High velocity

Anatomy Review



Retroperitoneal Space

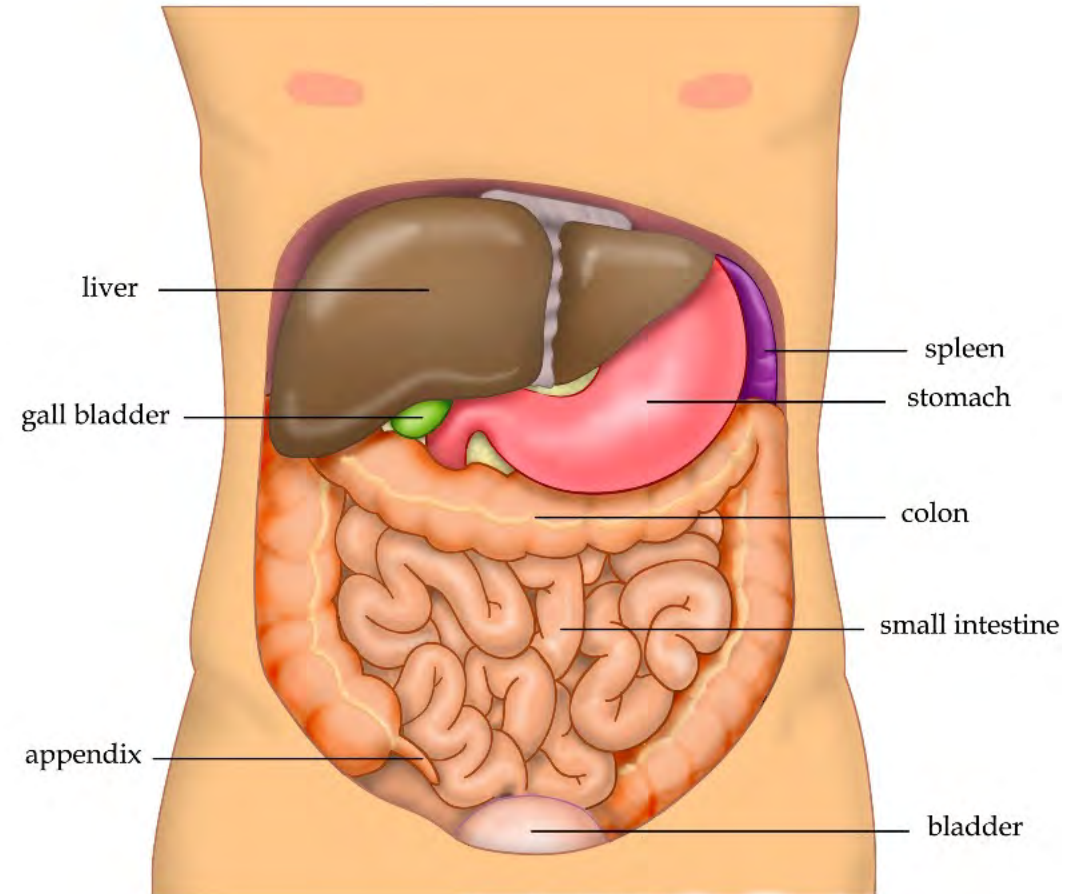
Abdominal Organs

Hollow

- Can rupture, causing content spillage, inflammation of peritoneum
- Stomach, gall bladder, large and small intestines, **ureters, urinary bladder**

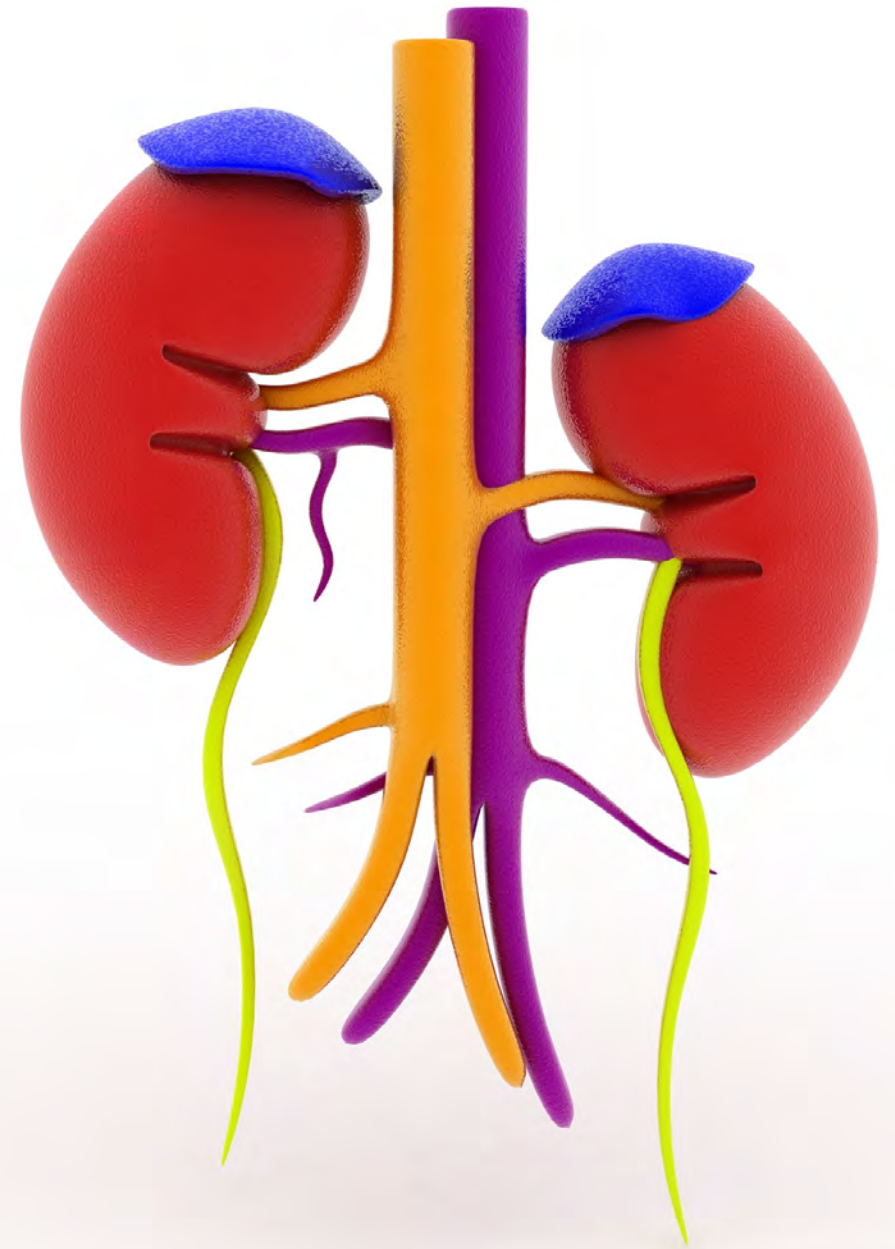
Solid

- Can bleed heavily and can eventually cause shock
- Liver, spleen, **kidney**, pancreas

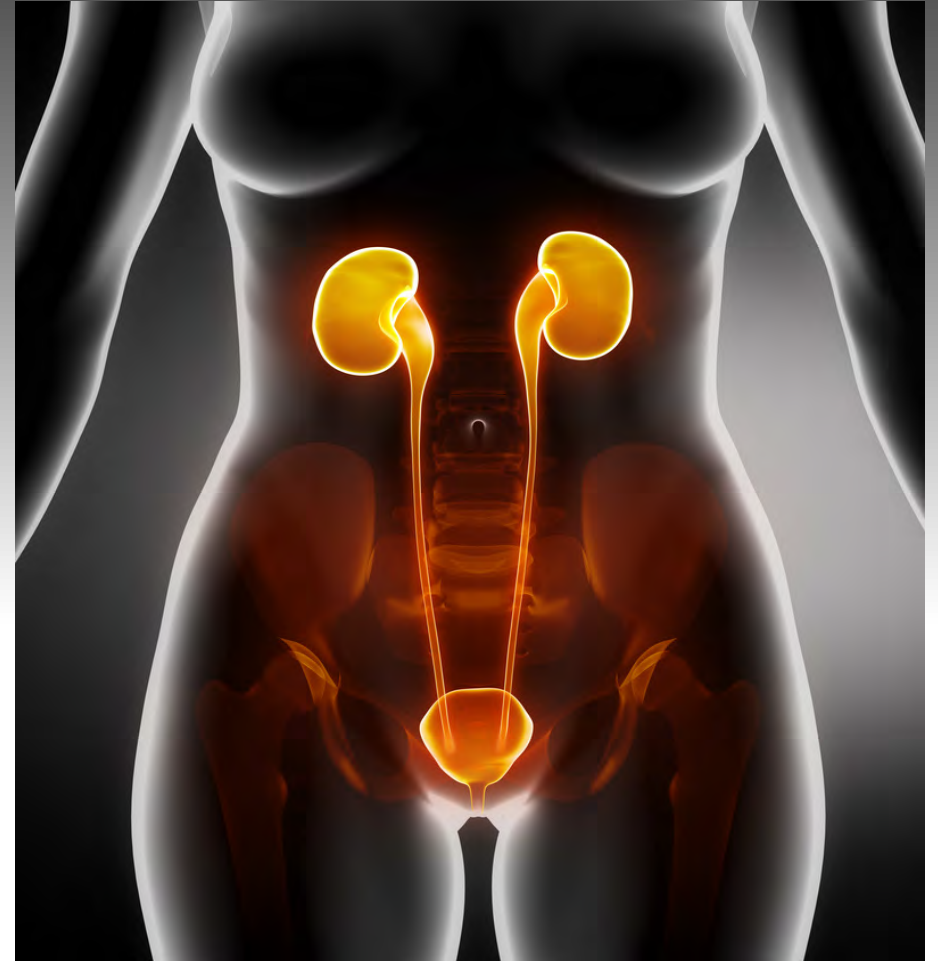


Kidneys

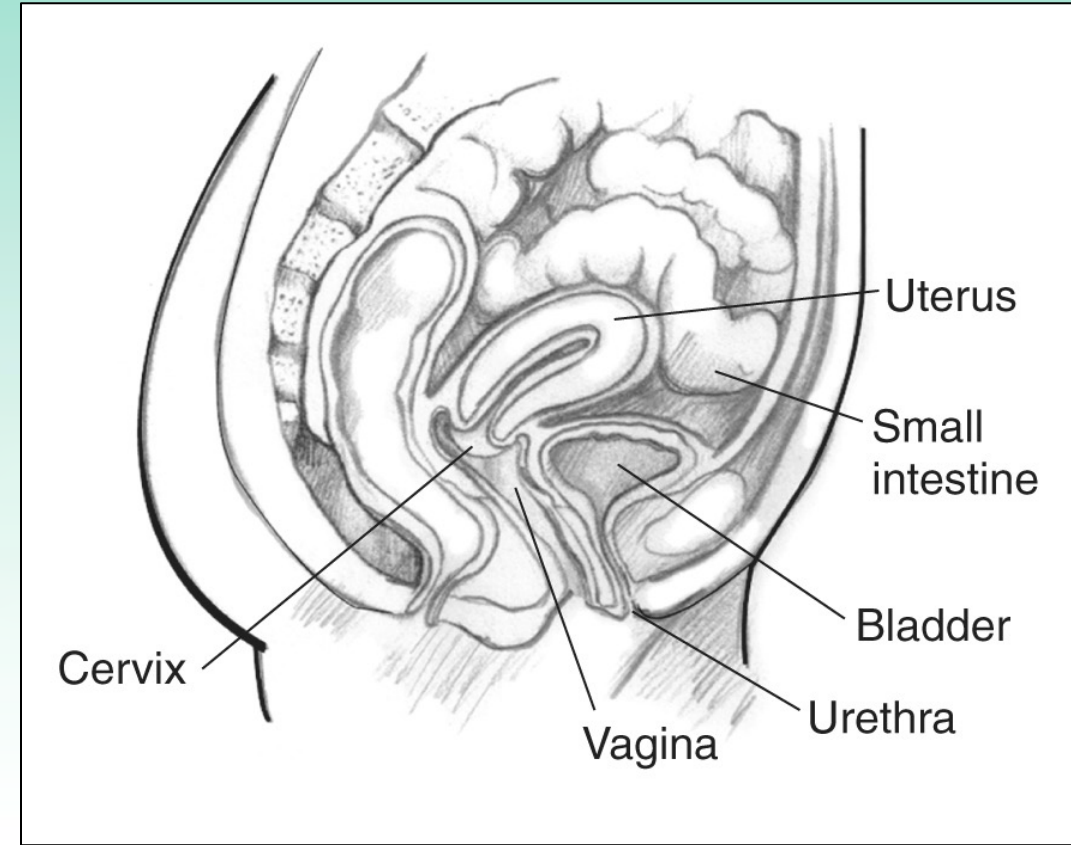
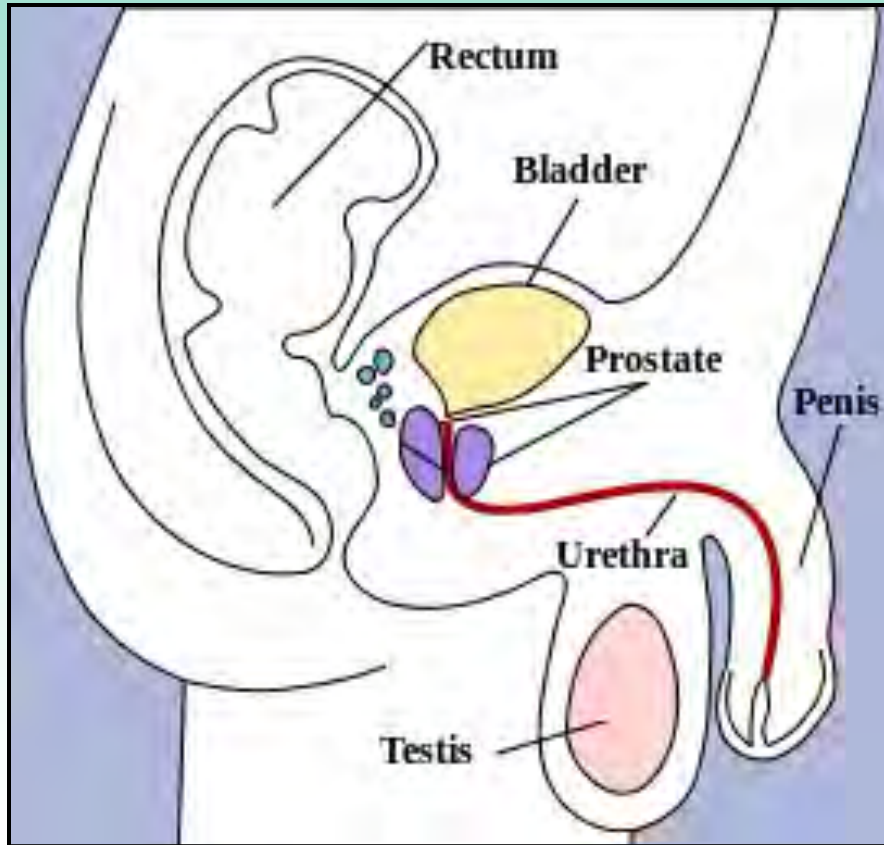
- Bean-shaped highly vascular organs
- primary function is to eliminate waste products
- Protected by 12th ribs, fat pads, and anchored by Gerota's fascia
- Left: protected by spleen, chest wall, diaphragm, pancreatic tail, descending colon
- Right: lower than left due to position of liver; protected by diaphragm, liver, duodenum



Bladder, Ureters, Urethra



Urethra



Indolencesderivative work: Aljullu, Public domain, via Wikimedia Commons

National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health.

Life Span Concerns: Geriatric



- Impaired ability to concentrate urine
- Decreased glomerular filtration rate
- Slight increases in blood urea nitrogen and creatinine expected
- Need to be cognizant of changes when using contrast media and certain drugs



Life Span Concerns: Pediatric

- Bladder is considered an abdominal organ in those less than 6 years of age
- Kidneys have less protection and are larger
- Renal injury is found in 10% of pediatric patients with abdominal trauma

Assessment

General Concepts

Follow ABC's, perform primary and secondary surveys as per ATLS, ATCN, CATN, TNCC recommendations

Consider the possibility of GU injuries when diagnostic testing orders are being submitted

Talk to the patient and find out what happened, what bothers them, what feels better, is the pain the same or getting worse

Past Medical History

GU History

- Congenital anomalies
- Past injury; surgery
- Chronic renal failure
- Renal artery stenosis
- When patient last voided
- Dialysis



Physical Assessment

- Inspection
- Palpation
- Gray Turner's Sign
- Percussion



Physical Assessment

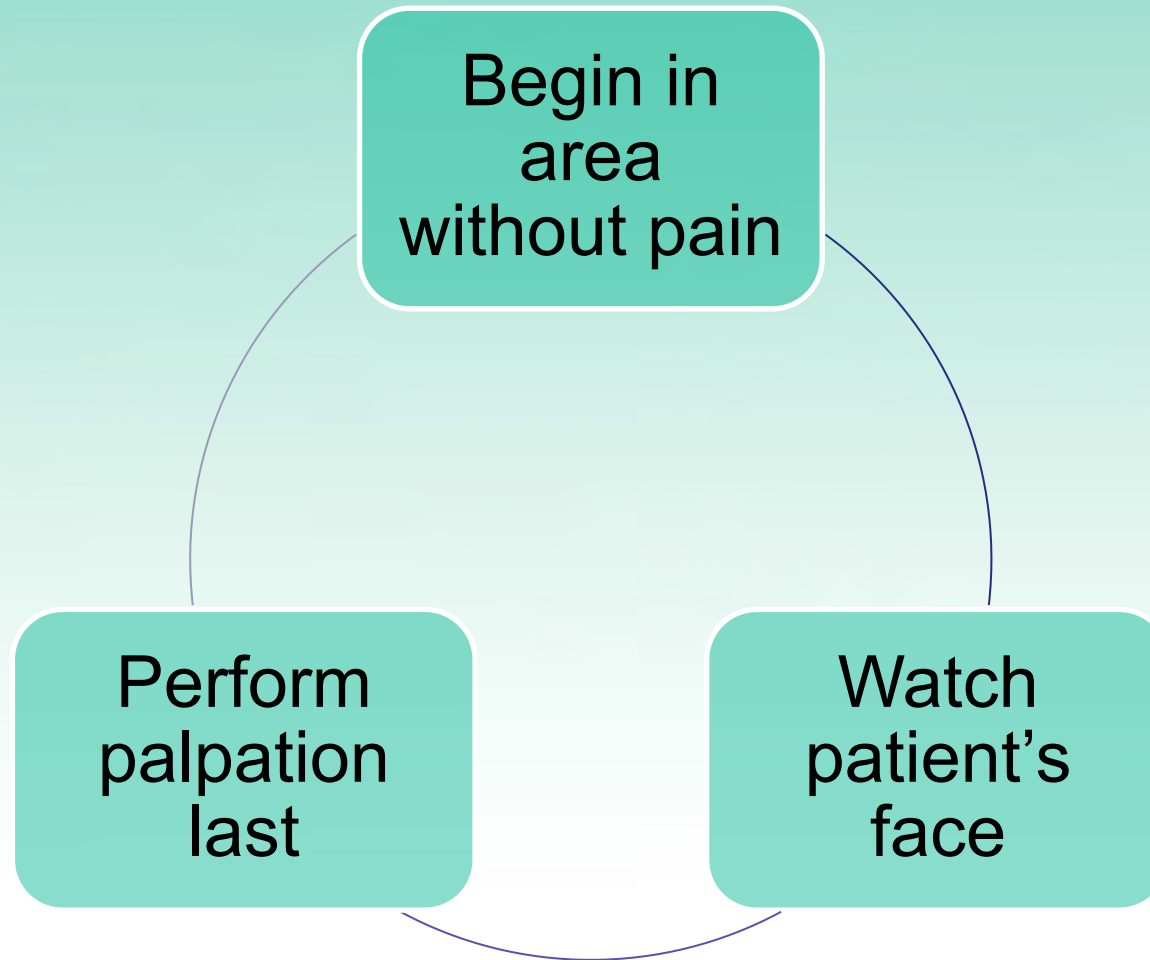
Perineal area

- Bleeding from urinary meatus
- Butterfly pattern ecchymosis
- Scrotal edema
- Prostate



Penque, Pediatric genitourinary trauma, 2014, <https://slideplayer.com/slide/14829324/>

Physical Assessment



Renal Trauma and Diagnostic Imaging

Discover fluid, foreign bodies and tissue damage

Demonstration of a functioning contralateral kidney

Evidence of ipsilateral renal function

Correlation of the assessed damage with the extent of hematuria



Garcia, R. TRAUMATISMO DE ABDOMEN Y PELVIS.

Diagnostic Imaging

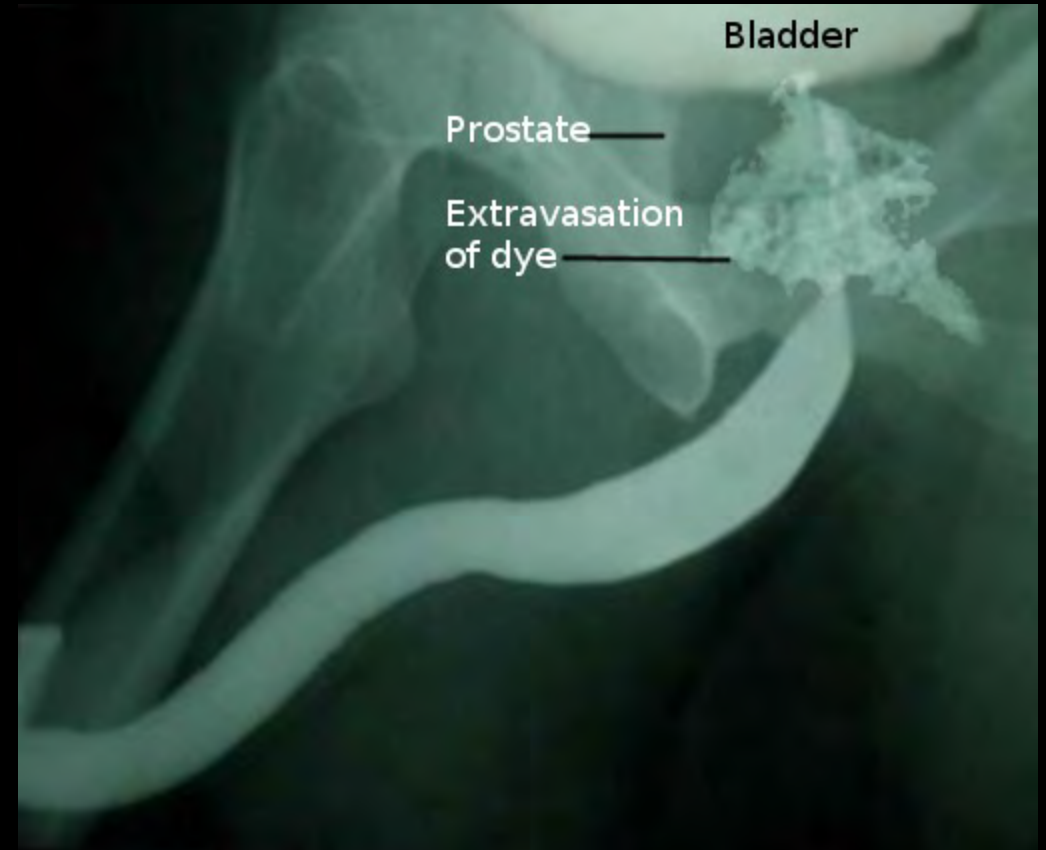
CT Scan

- The preferred imaging study is contrast-enhanced CT
- Highly sensitive and specific (staging)
 - Extravasation of contrast-enhanced urine
 - Associated injuries

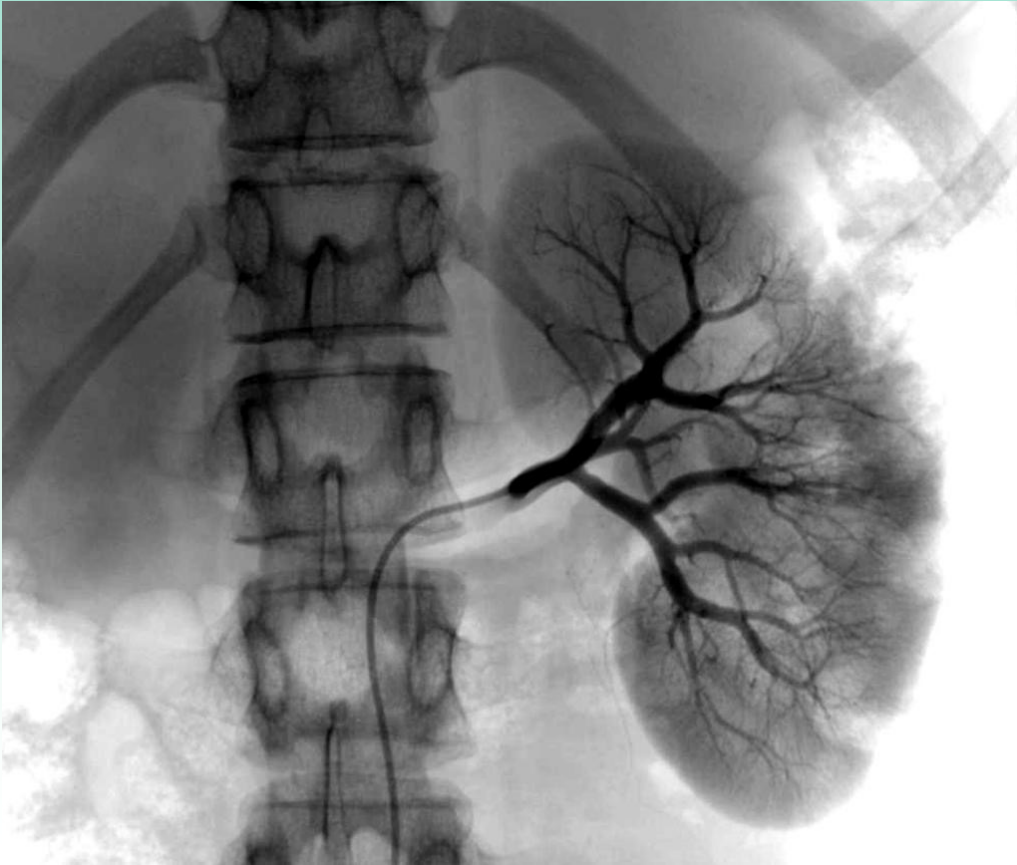


Diagnostic Imaging

- Cystogram/urethrogram
 - Hematuria
 - Bladder injury
 - Intraperitoneal
 - Extraperitoneal
- Retrograde urethrogram (RUG)
 - Urethral injuries
 - Blood at urinary meatus
 - High prostate in males



Diagnostic Imaging



Angiography and Interventional Radiology

- International trends toward less invasive treatment
- Used more frequently
- Successful management of all grades of renal injuries
- Mortality significantly reduced

Diagnostic Imaging

- Excretory urography or intravenous pyelogram (IVP) also called Intravenous urogram (IVU)
- Renal ultrasound



Diagnostic Labs

- Remember the absence of gross or microscopic hematuria does not rule out an injury.
- Myoglobinuria can result in Acute Tubular Necrosis (ATN).
- Urine dipstick and UA are poor indicators of the degree of GU injury.

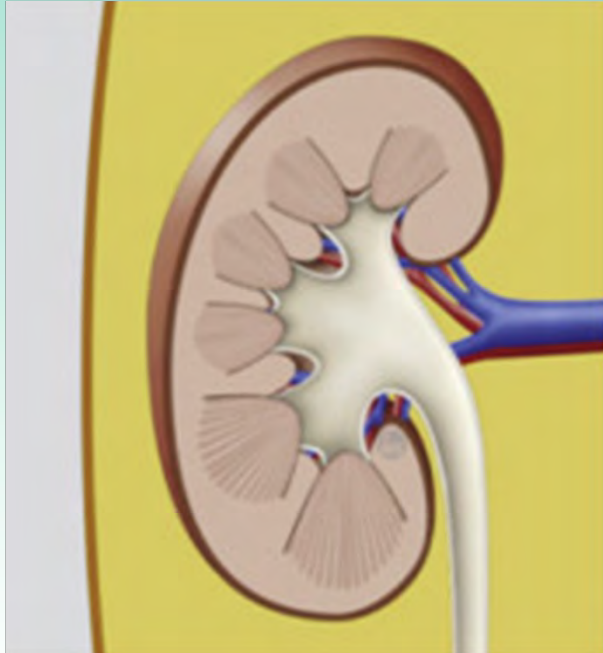


Specific GU Injuries

- Pathophysiology
- Clinical Evaluation
- Diagnostics
- Management
 - Non-operative
 - Operative
 - Complications



Kidney Trauma



Normal Kidney

Occurs in ~10% of patients with abdominal trauma

Most common organ damaged by blunt trauma in the pediatric population

Accounts for ~50% of all GU trauma

Kidney Trauma

Penetrating

- Across all age groups, right renal and hepatic injuries co-exist in ~70% of cases
- Nearly 30% of penetrating trauma has left renal and splenic injuries

Clinical Evaluation Signs and Symptoms

Ecchymosis over flank

Flank and abdominal tenderness during palpation

Gross or microscopic hematuria, absence does not rule out injury

Depending on extent of injury/injuries, may display signs and symptoms of shock

Hematuria

- Gross microscopic hematuria following abdominal trauma indicates renal injury.
- 80% of all renal trauma cases have it.
- It is common even with minor renal trauma (i.e. contusions).
- Absence of hematuria does not exclude a renal injury.
- Gross hematuria usually diminishes dramatically 2-6 hours after injury.



Minor Kidney Injury Management

Managed conservatively

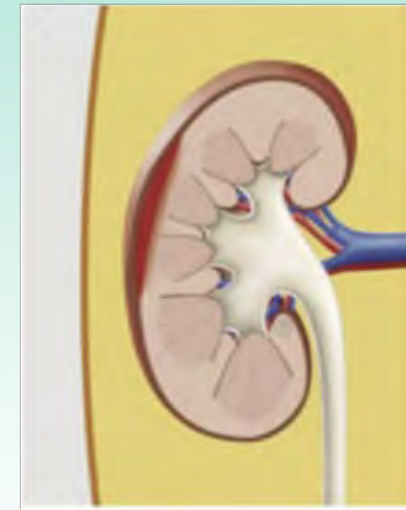
Frequent monitoring of vital signs and hematocrit

Frequent reassessment of abdomen

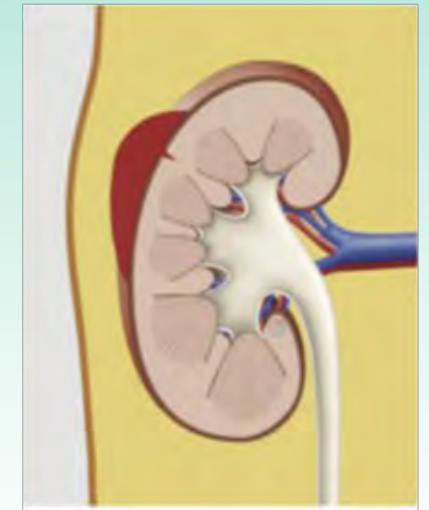
Bed rest with a gradual increase in activity and diet

Pain control

Follow up imaging is only indicated with signs of complication

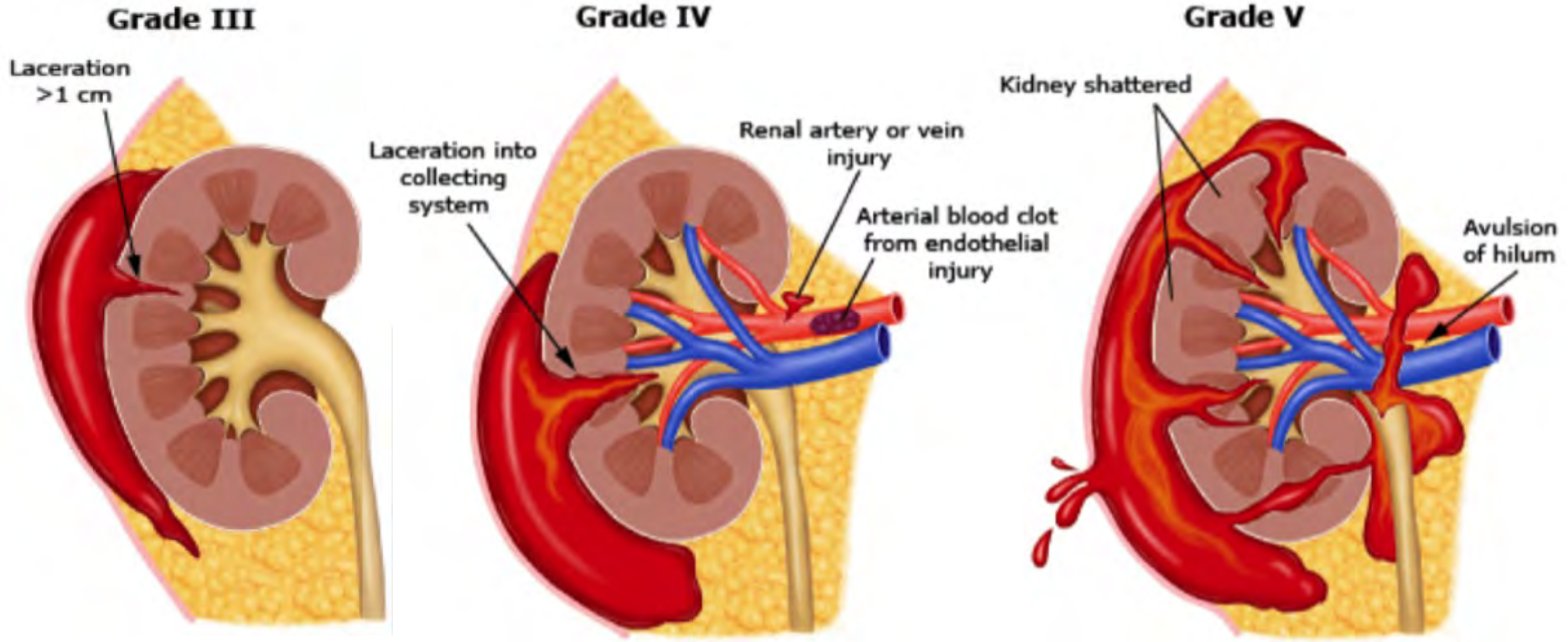


Grade 1

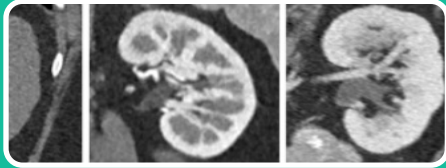


Grade 2

Major Kidney Injury Management

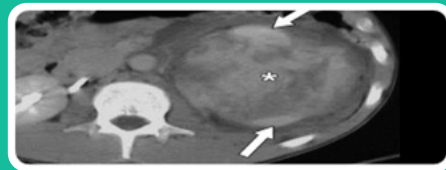


Major Kidney Injury Management

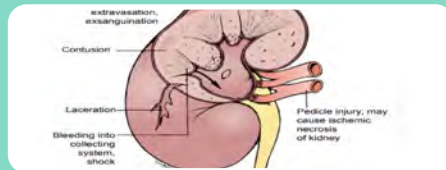


Re-imaging is indicated in grade IV-V with signs of complication

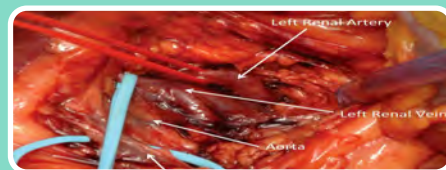
- Routine follow-up imaging is not supported by current evidence



Shattered kidneys and those with pedicle injuries may be removed to control hemorrhage



High grade renal injuries, penetrating mechanism and metabolic acidosis are risk factors for surgical intervention



Surgical Intervention

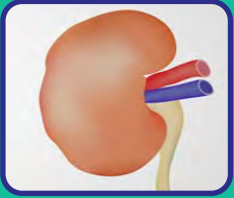
- Renorrhaphy
- Nephrectomy, partial or full



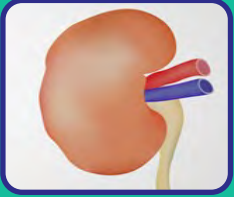
Renovascular Injury

- Interventional Radiology and Embolization
- Intimal tears - thrombosis in renal pedicle

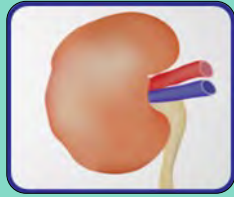
Nonoperative Management



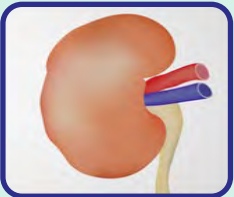
98% of all kidney injuries can be managed non-operatively with good outcomes



80% of major kidney injuries (grade III-V) can be managed non-operatively or with minimally invasive endovascular treatment



Can be used to treat pseudoaneurysm, AV fistula, for stenting



Grade IV and V injuries more often require surgical intervention in hemodynamically unstable patients, although this is rare

Kidney Trauma Complications

Minor Trauma

Sepsis

Decreased H/H

Expanding perirenal mass

Hemodynamic instability

Major Trauma

Abscess/urinomas

Sepsis

Fistula

Renal atrophy

Renal HTN

Complications of Renal Trauma

Post-Traumatic HTN

- Caused by excess of renin excretion, infarct, and renal scarring
- Can occur in 0 - 30% of renal trauma cases (4.2% in pediatric patients)
- Most are managed conservatively with a low-dose medication regimen

Ureter Trauma

- Occurs in less than 5% of GU trauma
- ~80% of ureter injuries are from GSW
- ~90% of GSW and ~60% of stab wounds that injure ureters also injure the bowel, colon, liver, spleen, blood vessels or pancreas
- Adjacent structures protect ureters from blunt trauma
 - Injury to the distal ureter can occur from fracture of the posterior pelvic ring

Ureter Injuries

Signs and Symptoms

- Often no presenting symptoms
- Pain only in obstructed ureter
- No symptoms with transection
- Possible loss of renal function
- Microscopic hematuria
- Index of suspicion



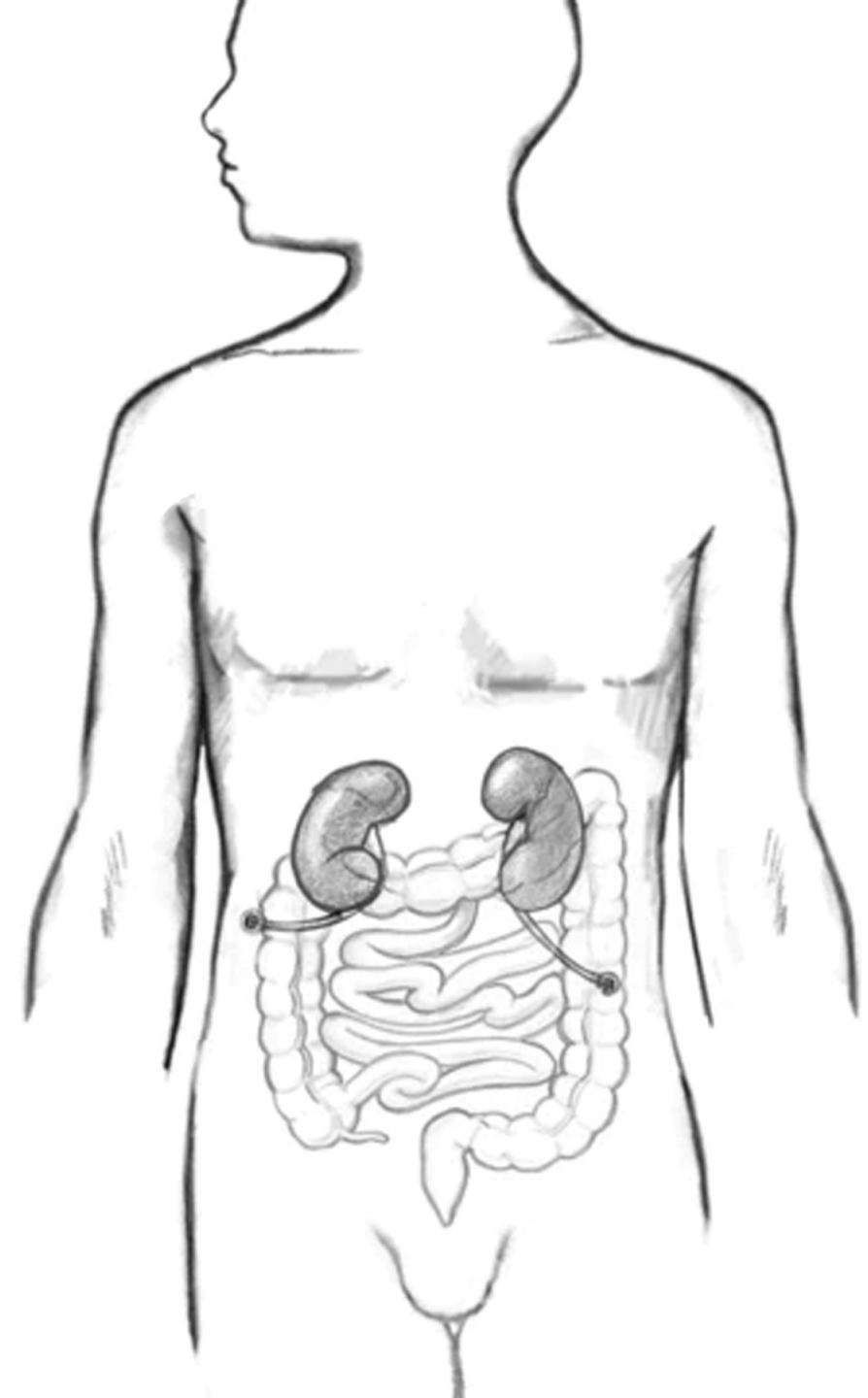
Ureter Trauma and Diagnostic Imaging



- Hematuria is usually microscopic, so it is usually not seen
- IVP (IV urogram)
- Retrograde pyelogram (RPG)
- CT urogram

Ureter Trauma Management

- Ureterostomy
 - Preferred
- OR
- Irrigation and Drainage
- Antibiotics
- Stenting



Complications of Ureter Trauma

Missed injuries usually manifest by:

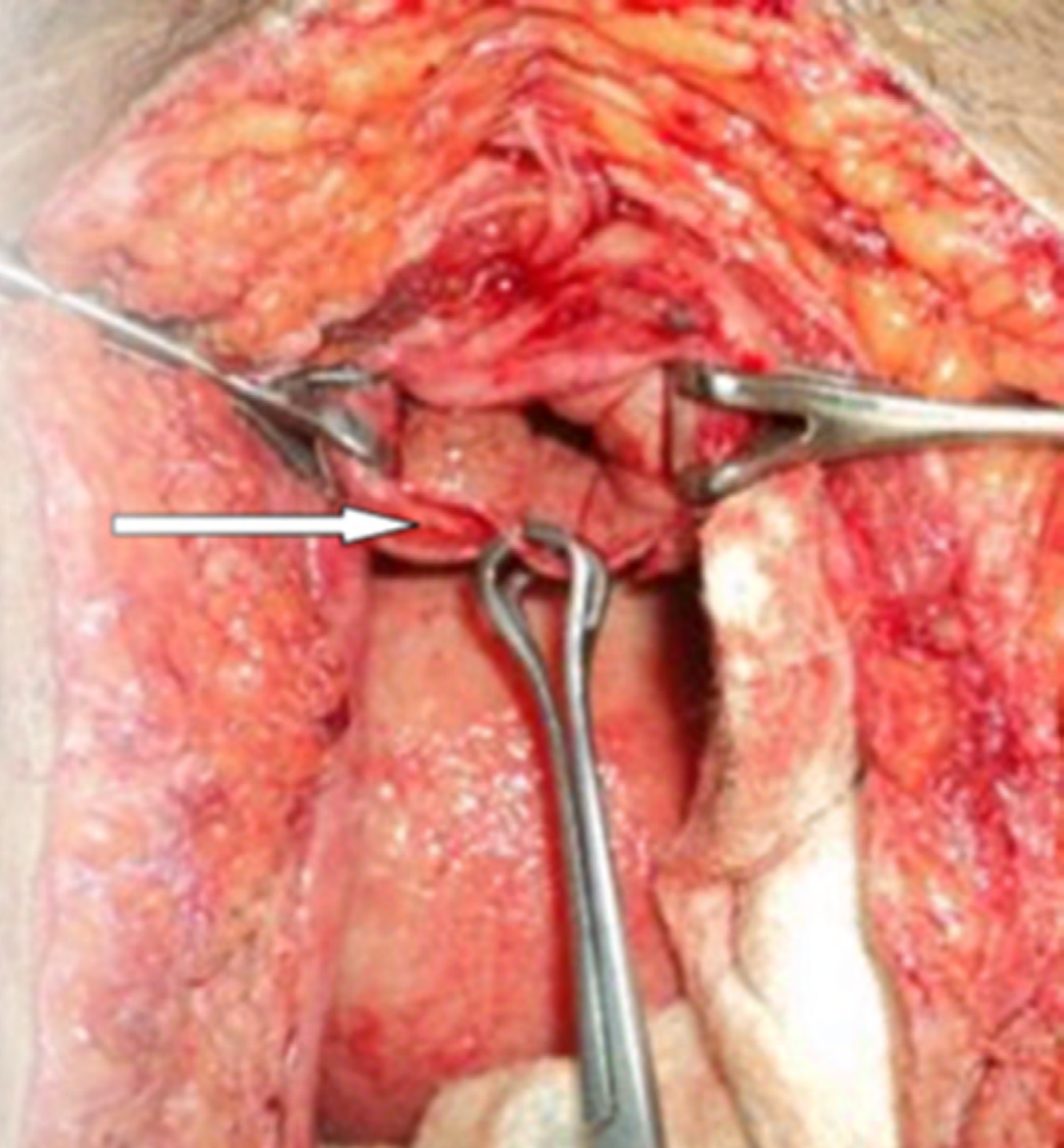
- Fever
- Flank mass or discomfort
- Ileus
- Leukocytosis
- Lethargy
- Urinary fistula to skin or vagina
- Sepsis
- Wound infection

Complications:

- Fistula
- Stricture or ureteral obstruction
- Retroperitoneal urinoma
- Infection
- Obstructive hydronephrosis

Bladder Trauma

- Most often injured due to blunt trauma
- Full bladder will increase risk of injury
- Two types of bladder injuries:
 - Extraperitoneal Bladder
 - Intraperitoneal Bladder



Extraperitoneal Bladder Injury



- Urine found in umbilicus, anterior thighs, perineum
- Dysuria
- Hematuria
- Suprapubic swelling, redness, tenderness
- Treated with foley catheter for urine removal

Intraperitoneal Bladder Injury



- Occurs with penetrating or blunt rupture of distended bladder
- 15-45% of bladder trauma
- Urgency and inability to void
- Signs and symptoms of shock
- Abdominal distension

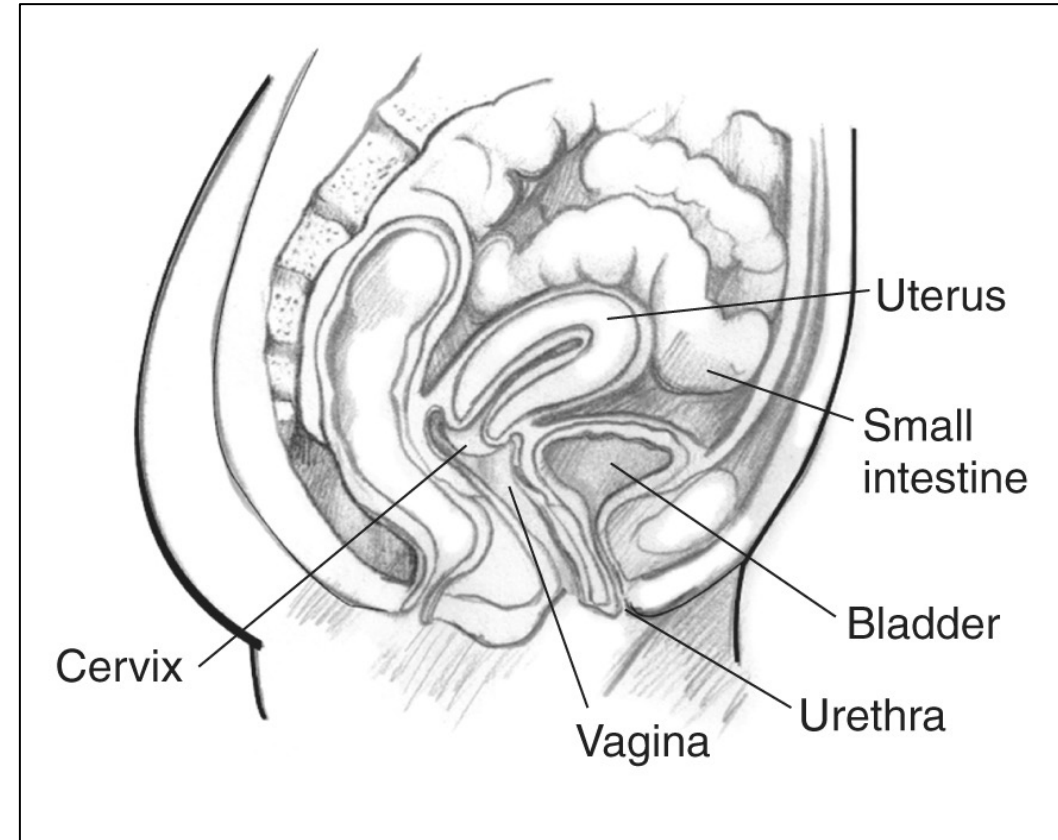
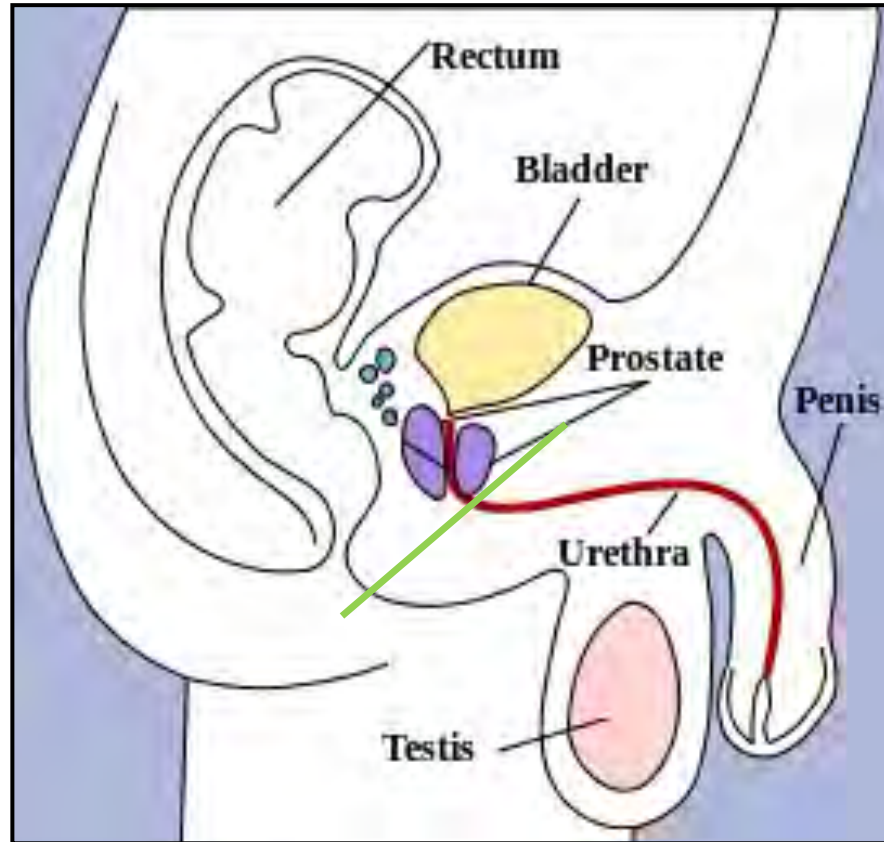
Complications of Bladder Trauma

- Mortality associated with bladder injury is estimated at ~10 - 40%. Higher mortality associated with intraperitoneal rupture.
- Death from a bladder injury is usually attributed to hemorrhage, sepsis or anorectal injury.

Urethral Trauma

- More common in males than females
- Urethra is divided in to the anterior and posterior sections
- The following will all impact on the selection of management for urethral trauma:
 - nature of the injury (blunt vs. penetrating)
 - location of the injury (ant vs. post)
 - completeness (partial vs. complete circumferential laceration)
 - presence and seriousness of associated injuries
 - the stability of the patient

Urethra



Urethral Injury: Male Mechanism

Anterior

- Straddle injury
- Crushing of urethra against symphysis pubis
- GSW-stab wound
- Self inflicted instrumentation
- Industrial or farm incidents

Posterior

Shearing in pelvic disruption pulls prostate and puboprostatic ligaments while membranous urethra and urogenital diaphragm are pulled in opposite direction

- Falls
- Crush
- Sports

General Signs and Symptoms of Urethral Trauma

- Suprapubic pain
- Urge to urinate but are unable to
- Hematuria (may be microscopic)
- Blood at external meatus

- Rebound tenderness upon palpation
- Abdominal wall muscle rigidity, spasm or involuntary guarding

Urethral Injury: Male Assessment

Anterior

- Localized pain in perineum
- Perineal or penile swelling
- Extravasation may cause scrotal, lower abdomen, penile swelling
- Butterfly-shaped hematoma under scrotum
- Painful voiding

Posterior

- Displaced prostate
- Blood at urinary meatus
- Distended bladder
- Inability to void

Urethral Trauma: Male Treatment

Anterior

- Bladder and suprapubic catheter
- Primary end to end anastomosis if no infection
- Contamination requires debridement, I&D and antibiotics

Posterior

- Retrograde urethrogram (RUG) before catheter placement
- Abdomen and pelvic films
- IVP, cystogram
- Suprapubic catheter
- Surgical intervention

Urethral Trauma: Male Complications

Anterior

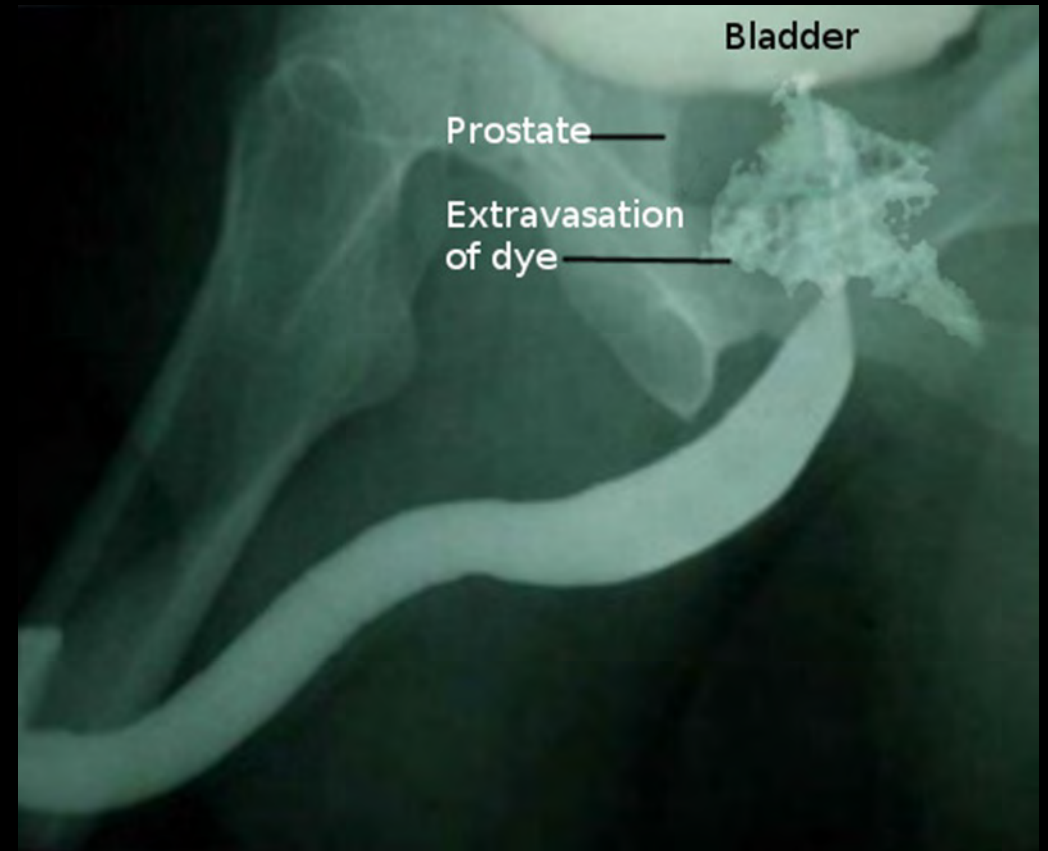
- Urethral reconstruction can have reanastomosis defects
- Urethral strictures
- Infection from extravasated blood or urine, which can lead to necrosis

Posterior

- Permanent impotence
- Permanent incontinence
- Cellulitis
- Sepsis
- Urethral stricture

Complete Urethral Disruption

Urethrogram demonstrating complete urethral disruption in a male



Female Urethral Trauma

Female urethral trauma usually coexists with vaginal lacerations, resulting in a urethrovaginal communication.

Clinical Signs

- Vaginal bleeding
- Labial edema
- Voiding difficulty
- Blood at the meatus
- Hematuria
- Urinary leak per rectum

Female Urethral Trauma

Delay in diagnosis may result in:

- Incontinence - Necrotizing fasciitis, sepsis
- Uretero-vaginal fistula
- Dyspareunia, recurrent urethritis
- Hematuria, cystitis

Symptoms Missed Injuries

- Fever
- Flank mass or discomfort
- Ileus
- Leukocytosis
- Lethargy
- Urinary fistula to skin or vagina
- Sepsis
- Wound infection

Reproductive System Trauma

- Can occur to both external and internal reproductive system
- External
 - Most common
 - Pain, extensive bleeding due to vascularity
- Internal
 - Rarely injured
- Management of specific injuries based on type and severity of trauma

Male Genitalia

Testes

- Usually spared from injury
- Direct blow impinges testes against symphysis pubis

Penis/Scrotum

- Zipper
- Foreign body
- Avulsion/Amputation
- Fracture
- Strangulation
- Suction
- Penetrating injury



Assessment

Testes, Penis, Scrotum

- Hematocele
- Large tender, swollen scrotal mass
- Failure to transilluminate
- Avulsion injury may be present
- Pain
- Swelling, discoloration
- Deviation away from lesion
- Possible urethral bleeding, hematuria, extravasation

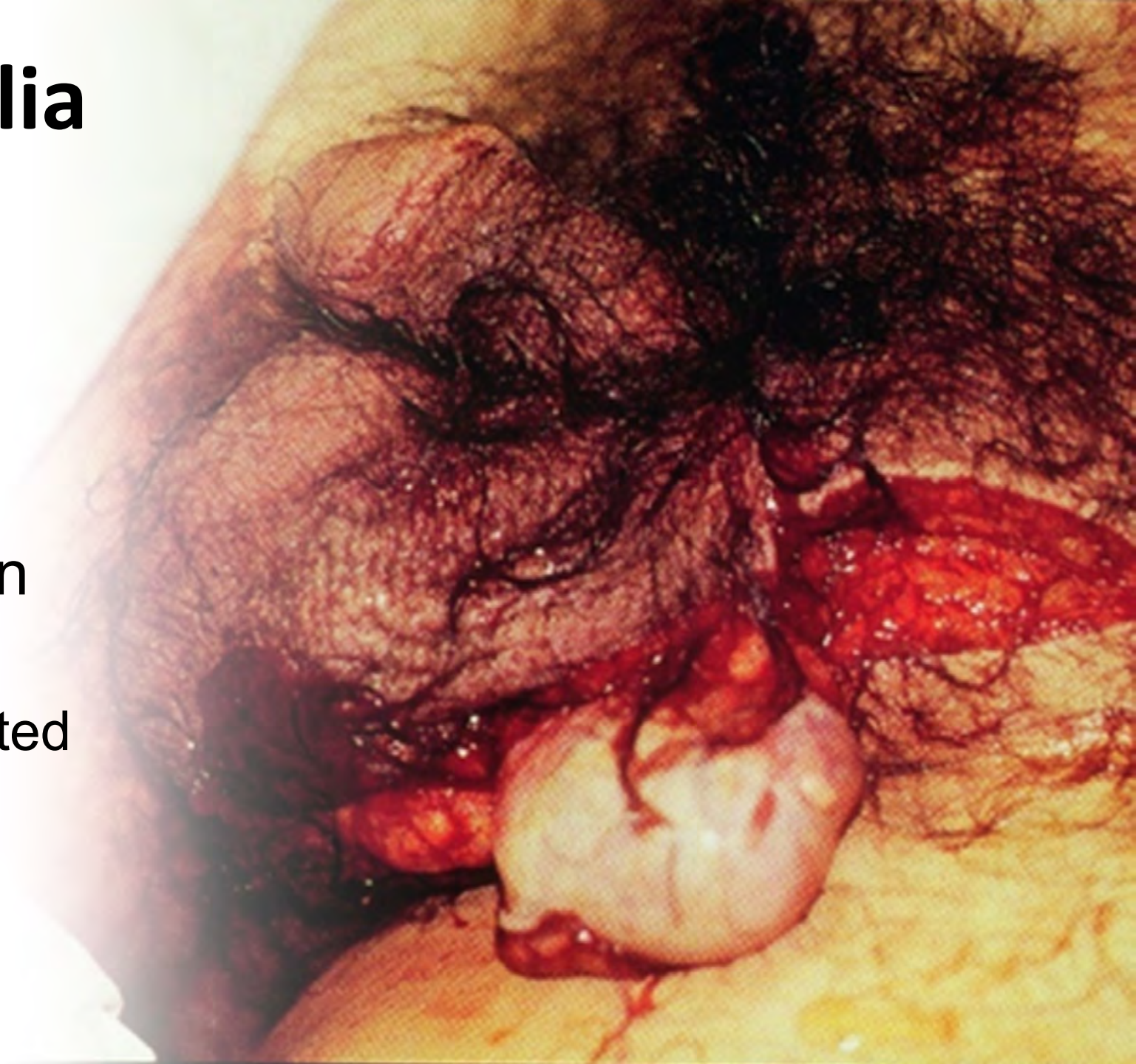


Management

- **Non-operative management**
 - Catheter or suprapubic catheter
 - Elevation and ice
 - Anti-inflammatory medications, analgesics
- **Surgical management**
 - Evacuation of hematoma and repair
 - Surgical reattachment if ischemia time less than 18 hours
- **Complications**
 - Infection of hematomas
 - Painful lumps
 - Inadequate erection
 - Permanent deformity

Male Genitalia

- Avulsion of skin of penis, scrotum
 - Cover with a moist, sterile dressing
- Complete amputation of penis
 - Treat as any amputated part



Female Genitalia



- Usually well protected by deep location within the pelvis except when pregnant
- In younger girls most common injuries to external genitalia:
 - Straddle injuries
 - Accidental penetration
 - Tearing due to sudden forced stretching of the perineum when the legs are forced apart (i.e. gymnastics, falls)

Female Genitalia

Vagina

- Mechanism
 - Pelvic fractures with vaginal and/or perineal injury
 - Penetrating injury to uterus and/or ovaries
- Assessment
 - Vaginal bleeding
 - Speculum exam essential with pelvic fractures
- Management
 - Surgical repair

Female Genitalia

Perineum

- Straddle injury
- Sexual assault
 - Introitus laceration
 - Anorectal lacerations
 - Urethra
- Use colposcope
- Evidence preservation
- Protect safety and psyche

Female Genitalia

Uterus, Ovaries

- Assessment
 - Signs of peritonitis
- Management
 - Surgical repair of minor lacerations
 - Hysterectomy and/or oophorectomy for major disruptions
- Complications
 - Abscess
 - Sepsis

General Management

- Monitor for bleeding and renal function
- Medications
 - Antispasmodics – bladder spasm
 - Phenazopyridine hydrochloride (Pyridium)
- Assess completely all women who present with external genitalia trauma for possible coexisting urological injury
- Support for sexual function, disfigurement
- Provide information

Summary

- The GU system has both solid and hollow organs.
- GU injuries are often accompanied by other system injuries, so a high level of suspicion is needed.
- There is a wide array of injuries than can occur to the male and female internal organs and genitalia.

Genitourinary Trauma

1. A urine specimen is ordered on a patient diagnosed with bilateral pubic rami fractures. When preparing to catheterize the patient, the trauma nurse observes blood at the urinary meatus. The nurse's next steps are to:
 - a. Stop the insertion and notify the trauma surgeon.
 - b. Insert the catheter and obtain the urine sample.
 - c. Cleanse the meatus thoroughly and insert the catheter.
 - d. Place the patient on a bedpan and obtain a mid-stream sample.

2. A 20 year-old male has suffered a gunshot wound to the upper left flank and abdomen. Your assessment reveals gross hematuria and an expanding palpable flank mass. He is complaining of flank pain and tenderness. HR 140, BP 80/40, RR 35. The trauma nurse should anticipate the following diagnosis:
 - a. Minor renal trauma
 - b. Major renal trauma
 - c. Grade III splenic laceration
 - d. Grade III liver laceration

3. A 67 year-old unrestrained male driver arrives in the ED after a head-on MVC. He is unresponsive, has a flail chest, obvious abdominal trauma and a pelvic fx. He is going directly to the OR due to his BP being 70 by palpation. The trauma nurse knows that they should:
 - a. Proceed with foley catheter insertion prior to taking to surgery.
 - b. Rule out a urethral injury before foley catheter insertion.
 - c. Put a condom catheter on the patient and send him to the OR.
 - d. Tell surgical nurse/Trauma surgeon/Anesthesia that there is blood at the meatus and no foley has been inserted.

4. A 3 year-old female is brought in to the ED by her mother. She says the child has been listless, complains of abdominal pain and has been complaining about having to go to the bathroom since she got up this AM. Child was reportedly fine yesterday. BP 40/80, P 100, RR 14, T 101.F. Has a firm, protruding, tense abdomen which is painful to touch. Bruising is noted on the abdomen and flank. Genitalia is swollen as well. Mother says child fell yesterday when playing outside. The trauma nurse knows to:
 - a. Prepare for abdominal CT Scan.
 - b. Initiate a trauma work-up (start IVs, make NPO, send labs, do not attempt to insert a foley or straight cath the patient until the extent of injuries are known)
 - c. Contact Social Work and let them know that there is suspected abuse case.
 - d. All of the above

5. A 34 year-old male sustained a Grade IV renal injury from a MVC. He has been managed non-operatively for over a week now. He was transferred 3 days ago from the step-down unit to the surgical floor. Nursing assessment and intervention priorities include all of the following EXCEPT:

- a. Monitoring of vital signs and hematocrit
- b. Reassessment of abdomen
- c. NPO
- d. Pain control

6. A 33 year-old female who boxes for fun on the weekends has sustained blunt trauma to the left kidney during a boxing match. Her chief complaint is flank tenderness and she has developed a bruise. Her urinalysis reveals microscopic hematuria. All of her other laboratory data are within normal limits. The trauma nurse suspects:

- a. Pulled muscles in the flank area
- b. Fractured iliac bone
- c. Retroperitoneal hematoma
- d. Kidney infection

7. The purposes of diagnostic imaging in renal trauma include all of the following EXCEPT:

- a. Determine if patient is hypervolemic
- b. Demonstrate a functioning contralateral kidney
- c. Evaluate ipsilateral renal function
- d. Correlate hematuria with parenchymal damage

8. Bladder injuries generally:

- a. Are isolated injuries
- b. Accompany pelvic trauma
- c. Caused by penetrating trauma
- d. Accompany kidney injuries

Genitourinary Trauma

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- c. Contact Social Work and let them know that there is suspected abuse case
- d. **All of the above**

5. A 34 year-old male sustained a Grade IV renal injury from a MVC. He has been managed non-operatively for over a week now. He was transferred 3 days ago from the step-down unit to the surgical floor. Nursing assessment and intervention priorities include all of the following EXCEPT:

- a. Monitoring of vital signs and hematocrit
- b. Reassessment of abdomen
- c. NPO**
- d. Pain control

6. A 33 year-old female who boxes for fun on the weekends has sustained blunt trauma to the left kidney during a boxing match. Her chief complaint is flank tenderness and she has developed a bruise. Her urinalysis reveals microscopic hematuria. All of her other laboratory data are within normal limits. The trauma nurse suspects:

- a. Pulled muscles in the flank area
- b. Fractured iliac bone
- c. Retroperitoneal hematoma**
- d. Kidney infection

7. The purposes of diagnostic imaging in renal trauma include all of the following EXCEPT:

- a. Determine if patient is hypervolemic**
- b. Demonstrate a functioning contralateral kidney
- c. Evaluate ipsilateral renal function
- d. Correlate hematuria with parenchymal damage

8. Bladder injuries generally:

- a. Are isolated injuries
- b. Accompany pelvic trauma**
- c. Caused by penetrating trauma
- d. Accompany kidney injuries

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