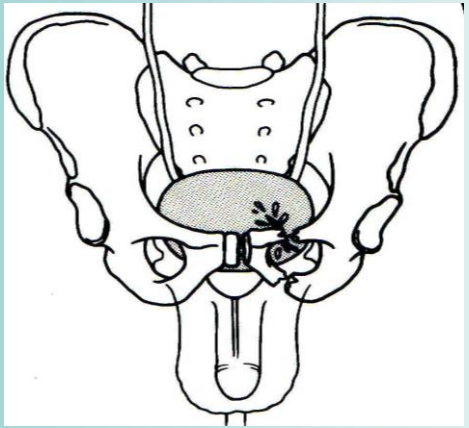
Canadian Undergraduate Urology Curriculum (CanUUC):

Genitourinary Trauma



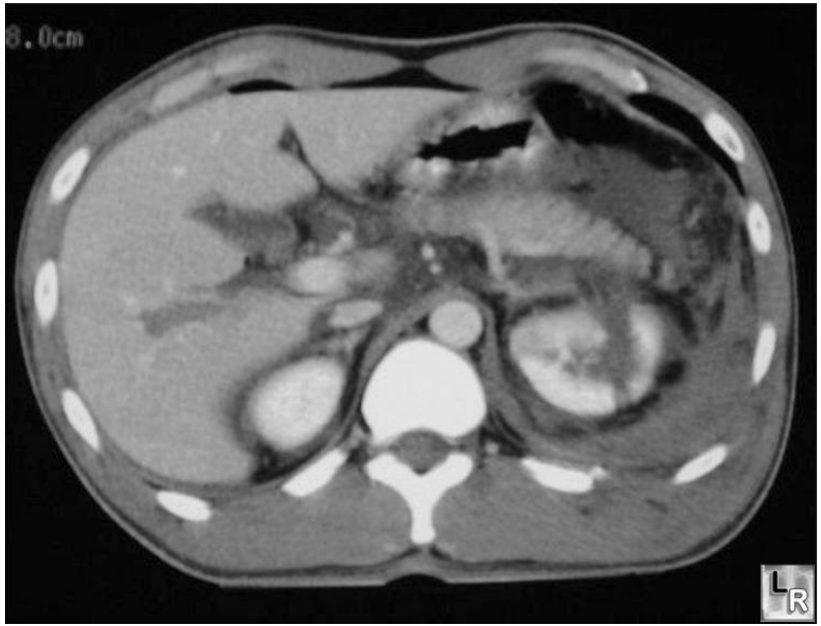
Session Objectives

1) Recognize hematuria as the cardinal symptom of urinary tract trauma.
2) Outline the investigations required and basic management of a patient presenting with hematuria in the trauma setting

GU TRAUMA - Overview

1) Renal Trauma
2) Ureter Trauma
3) Bladder Trauma
4) Urethral Trauma
5) External Genitalia Trauma

Renal Trauma



Renal Trauma - Mechanism

Blunt Trauma

(90%)

- MVA, falls
- May cause contusion, laceration, avulsion
- Usually conservative Treatment

Penetrating Trauma

(10%)

- "Blast effect" - radiating current of energy
- Adjacent tissue necrosis
- Often are associated injuries
- Selective observation vs operative treatment

Renal Trauma:
Clinical Clues, Signs and Symptoms

- ❑ Hematuria**
- ❑ Flank Pain**
- ❑ Sudden deceleration/fall
- ❑ Flank bruising
- ❑ Broken ribs (11th and 12th)
- ❑ Lower chest/upper abdomen trauma

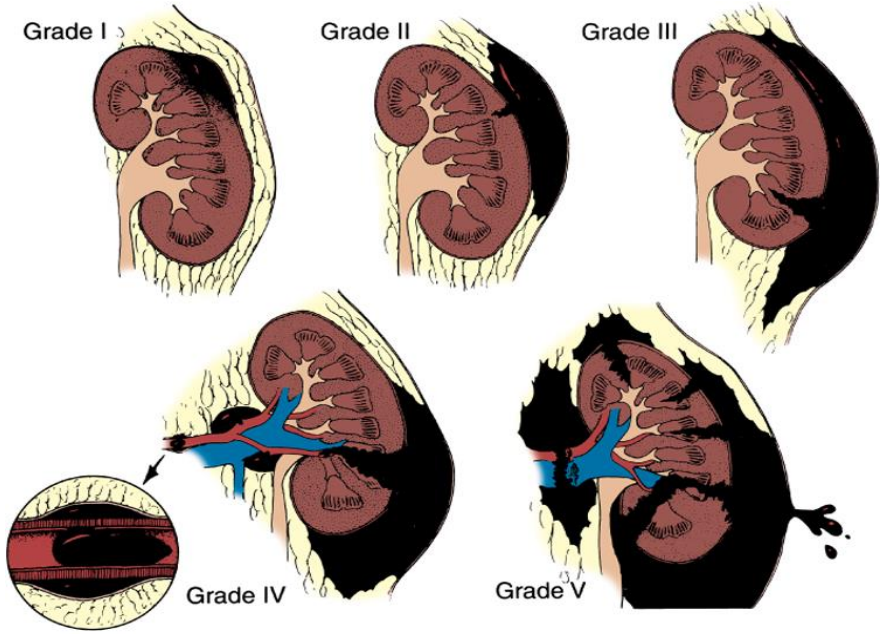
Cases of renal trauma with absent hematuria

- **Hematuria may be absent in 10-20 %**
- **Trauma not communicating with the renal pelvis**
- **Avulsion of pedicle**
- **Obstruction of ureter with clot**

American Association of Trauma Surgery

- Grade I - Contusion (normal imaging); subcapsular hematoma
- Grade II – Non-expanding perirenal hematoma; <1cm cortical laceration
- Grade III - >1cm cortical laceration (no collecting system injury)
- Grade IV - > 1cm laceration extending into medulla and collecting system; Artery or vein injury (controlled hemorrhage)
- Grade V - Completely shattered kidney; Hilar avulsion (devascularized kidney)

Renal Trauma Grading System



Renal Trauma:
Evaluation: Urinalysis

- **Urinalysis**
  - "+" in 95% of renal trauma
  - Degree *does not* reflect severity - can be negative even if major pedicle injury

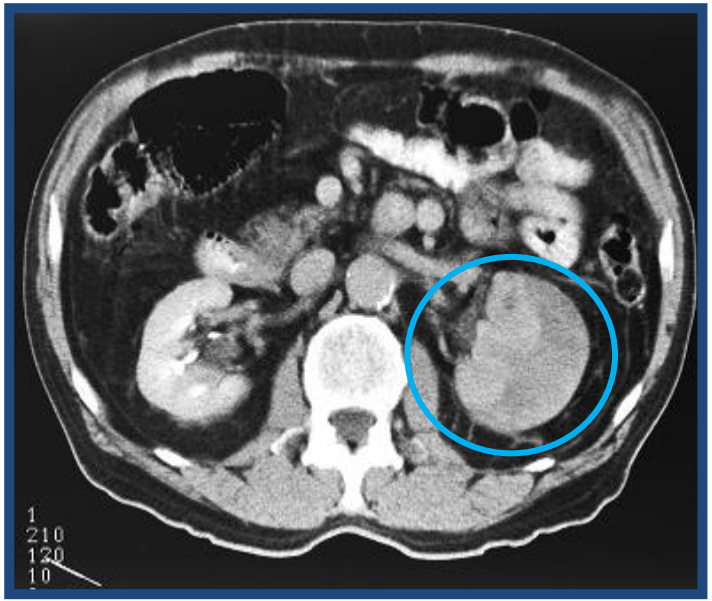
Renal Trauma:
Findings on Imaging

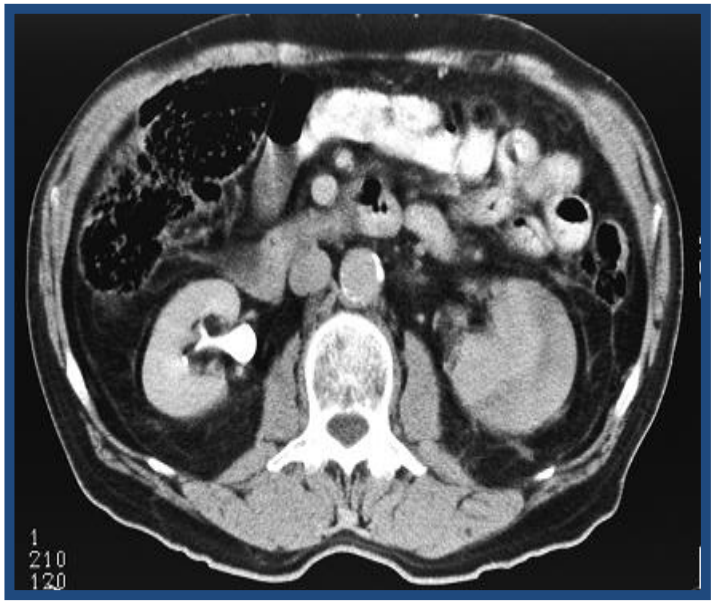
- **Plain Film:**
  - Rib fracture
  - Loss of psoas shadow
  - Scoliosis - psoas spasm
- **IVP:**
  - Used intra-operatively
  - Determines presence of functioning contralateral kidney
- **CT Abdomen with contrast:**
  - ***Single Best study***
  - Detects hematomas, lacerations, pedicle injuries, urine leaks & devascularized segments

Renal Trauma:
Indications for Imaging (i.e. CT)

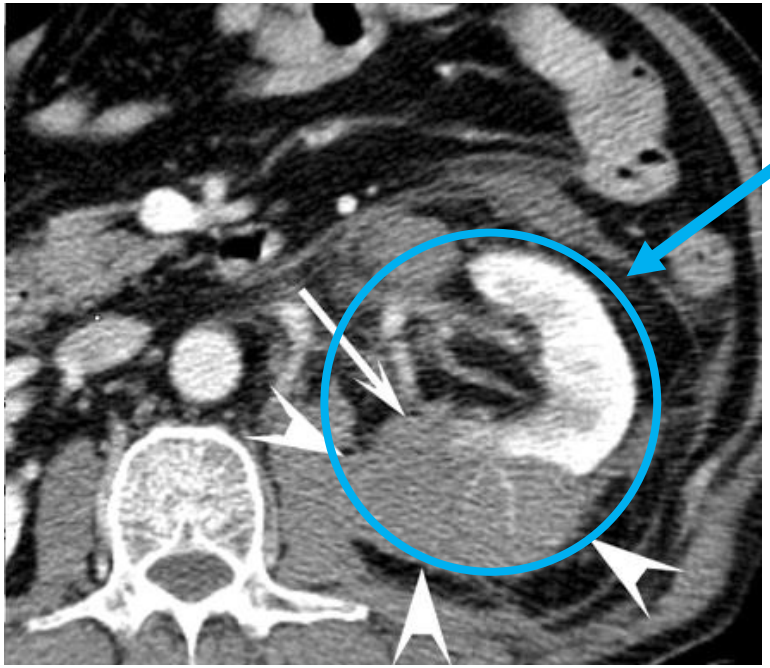
- **Penetrating trauma***
  - Always needs imaging
- **Blunt Trauma:**
  - Adults
    - Macroscopic (gross) hematuria
    - Microscopic hematuria and hypotension (<90mmHG)
    - Rapid deceleration injury
  - Pediatrics
    - *All* trauma with gross *or* microscopic hematuria, stable or unstable

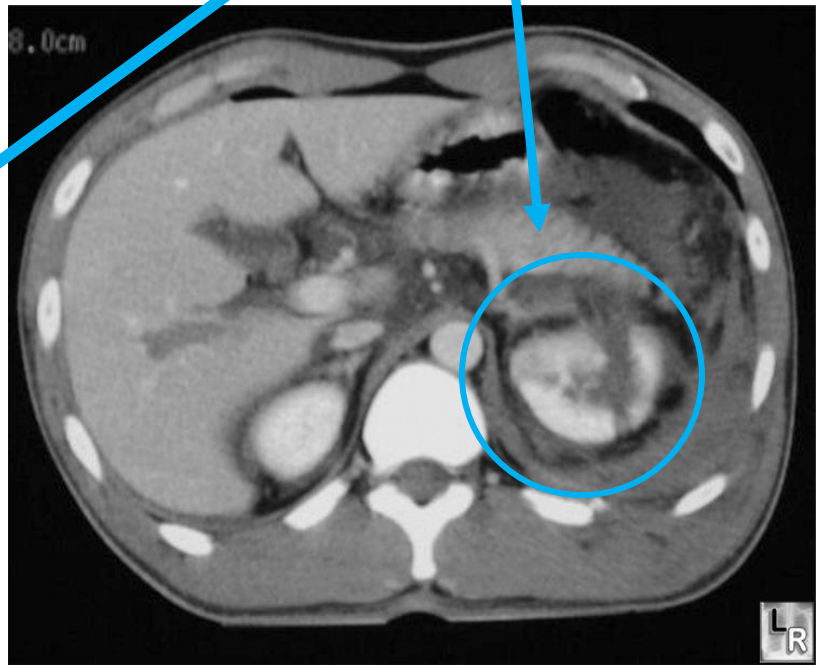
Renal Trauma - CT Abdomen:
Grade I - Subcapsular Hematoma



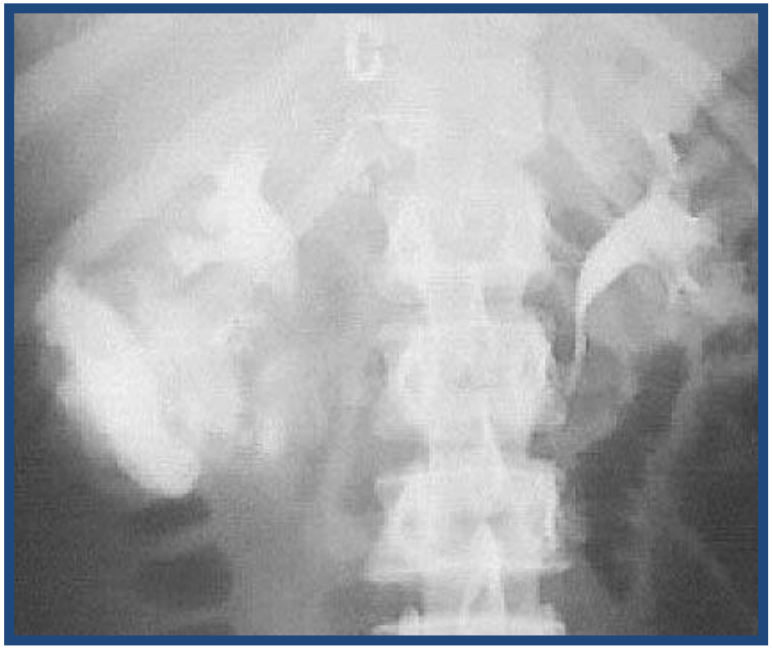


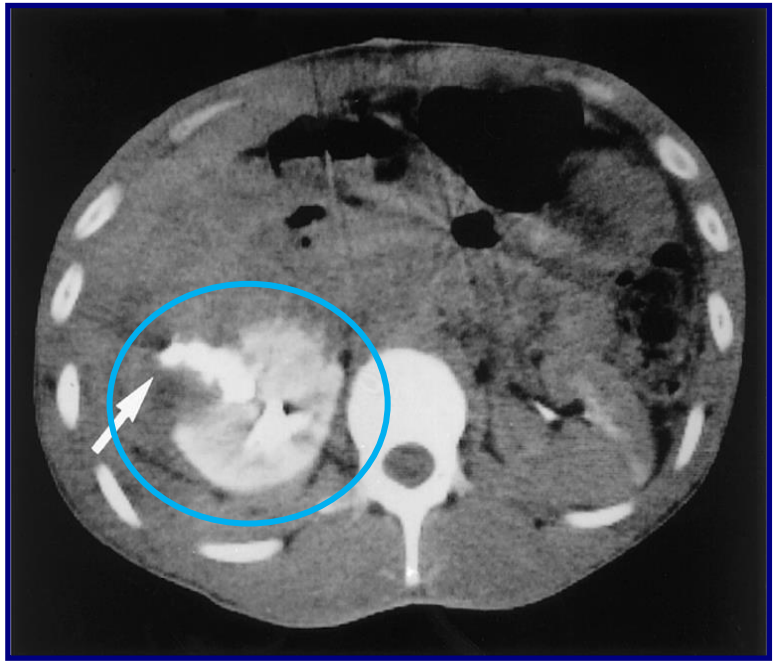
Renal Trauma - CT Abdomen: Grade II & III Laceration



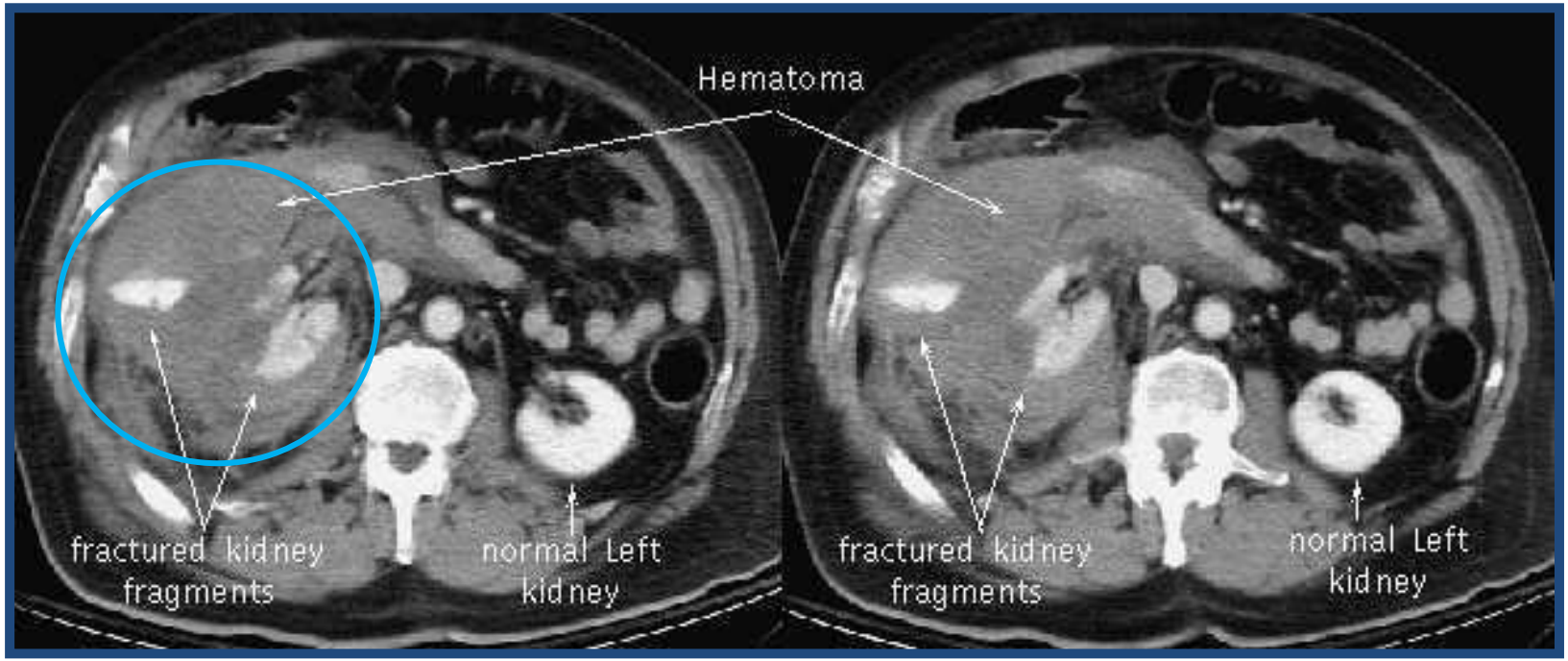


Renal Trauma – CT Abdomen: Grade IV Laceration





Renal Trauma - CT Abdomen: Grade V - Shattered Kidney



Renal Trauma:
Operative Intervention

- **Absolute Indications:**
  - Uncontrolled bleeding
  - Unstable patient (hypotension)
  - Expanding RP hematoma during concurrent laparotomy
  - Major renal artery injury bilaterally or in a solitary kidney
- **Relative Indications:**
  - Renovascular injury
  - Large amounts of nonviable parenchyma
  - Major urine leaks

Renal Trauma:
Operative Exploration - Technique

- Midline laparotomy
- Allows for inspection of other organ systems
- Goals:
  - Damage Control
  - Stop Bleeding
  - Control urine leak

Renal Trauma: Complications

- **Early Complications:**
  - Delayed bleeding
  - Urinoma
  - Abscess
- **Late Complications:**
  - Hypertension
  - Arteriovenous fistula
  - Renal failure

Renal Trauma - Summary

- Found in ~ 10% of abdominal trauma
- Hematuria is the cardinal symptom
- 90% blunt
- Greatest determinant of mortality is severity of concurrent injuries
- Accurate staging (CT) is very important

Ureteral Trauma

Ureteral Trauma

- *Least* commonly injured part of GU tract
  - Small & mobile
  - <1% of GU injuries
- Etiology:
  - External trauma (<1% have ureter injury)
  - Iatrogenic Trauma
    - Gynecology, vascular surgery, general surgery…

Ureteral Trauma: Diagnosis

- **Hematuria:**
  - Occurs in 90% of external trauma
  - Only in 10% of iatrogenic injury
- **Intravenous Pyelogram (IVP)** identifies injury in 94% and identifies level in 50%
- **Direct** inspection during laparotomy is *the best diagnostic tool*
- Must exercise a high index of suspicion

Ureter Trauma: Classification

- **Mechanism**
  - Blunt
  - Penetrating
- **Level of Injury**
  - Proximal, Mid, Distal
- **Time of Recognition**
  - Early
  - Delayed

Ureteral Trauma: Complications

- Ureteral stricture
- Urine leak, urinoma
- Pyelonephritis

Bladder Trauma

Bladder Trauma: Mechanism of Injury

- 80% of injuries have associated pelvic fracture
- ~10% of pelvic fractures have bladder injury
- **Blunt Trauma (80%)**
  - 90% associated with MVA
- **Penetrating (20%)**
  - Iatrogenic & gunshots

Bladder Trauma:
Signs and Symptoms

- **Gross hematuria (>95%)**
- Associated Injuries/Mechanism
  - Pelvic fracture
  - Rapid deceleration
- Lower abdominal pain (62%)
- Rectal & vaginal exam important

Bladder Trauma:
Diagnosis - Cystogram

- **<u>Cystogram is the most important test</u>**
- **<u>Indications:</u>**
  - Gross hematuria
  - Multiple organ injuries & pelvic fractures with microscopic hematuria
- **Not microscopic hematuria alone**

Bladder Trauma:
Standard Cystogram

- **Consider retrograde urethrogram (RUG**
  - 10-20% have concurrent urethral injury
- **Minimum 300mL gravity filled contrast**
- **Views**
  - Plain film
  - Stress cystogram
    (anteroposterior & oblique)
  - Post drainage

Normal Cystogram

Bladder Trauma:
CT Cystogram

- **CT abdomen/pelvis *before & after* bladder contrast**
- **Look for:**
  - New or increasing extraperitoneal contrast
  - New extraluminal contrast surrounding bowel loops or in paracolic gutters
- **At least as good as (likely better) than standard cystogram**

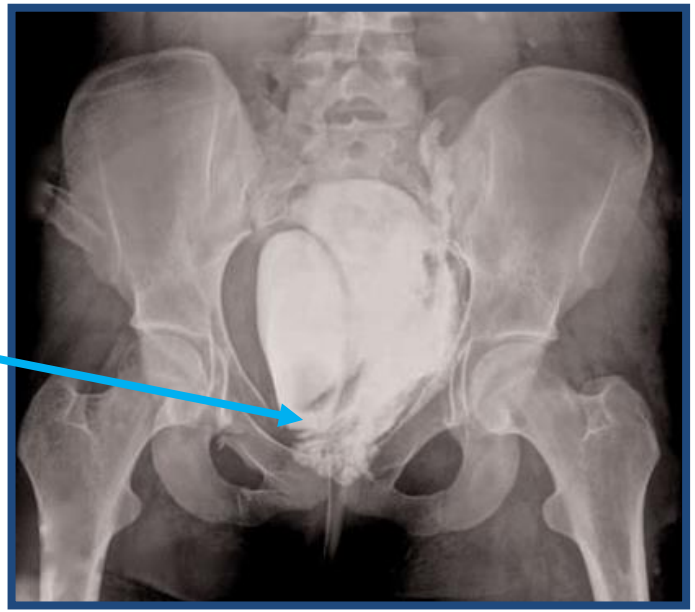
Bladder Trauma: Classification

Based on cystogram

- **Blunt Trauma**
  - Contusion
  - Intraperitoneal Rupture
  - Extraperitoneal Rupture
  - Intra & Extraperitoneal
- **Penetrating Trauma**

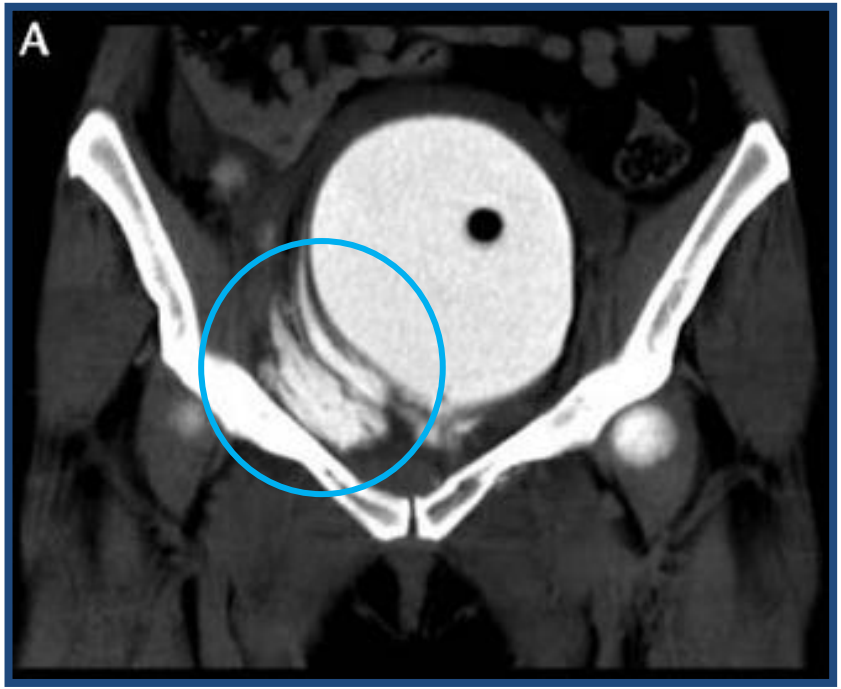
Blunt Trauma:
Extraperitoneal Rupture

- More common - 60%
- Extravasation through retroperitoneum
- Less severe pain
- “Flame” shaped collection around bladder base
- Pelvic hematoma effect



CT Cystogram:
Extraperitoneal Rupture

- Extravasated contrast in the space of Retzius

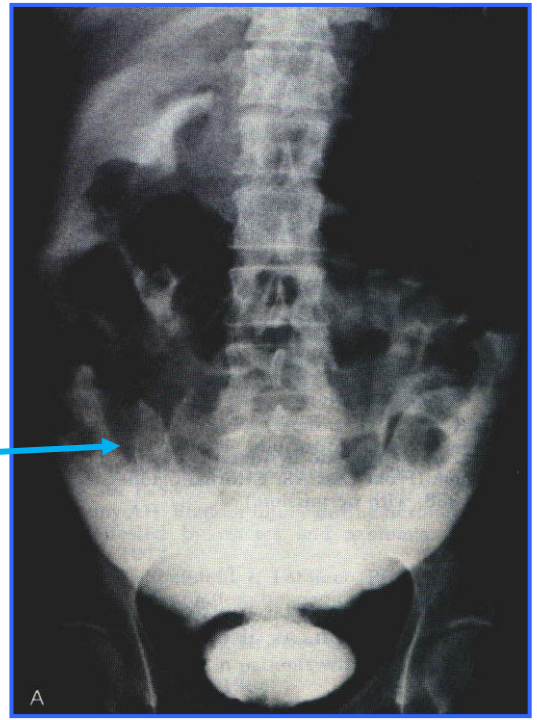


Treatment:
Extraperitoneal Rupture

- **LARGE catheter drainage x 10days**
- **Prophylactic antibiotics**
- **Cystogram prior to catheter removal**
- **<u>Open repair if:</u>**
  - Laparotomy for concurrent injuries
  - Laceration of bladder neck, vagina or rectum

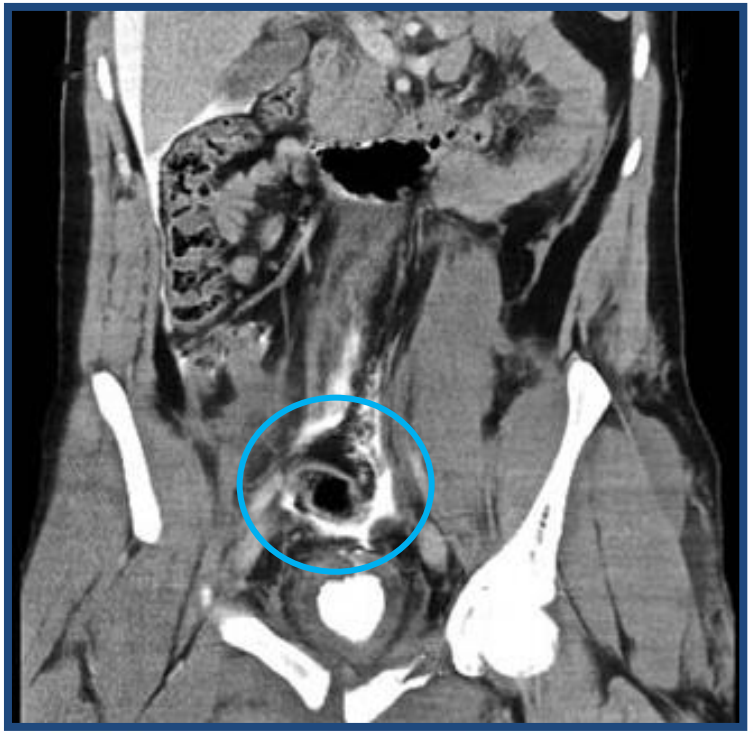
Blunt Trauma:
Intraperitoneal Rupture

- Less common – 30%
- Rapid rise in pressure
- Ruptures at dome (weakest point)
- Outlined bowel loops
- Filling cul-de-sac & paracolic gutters



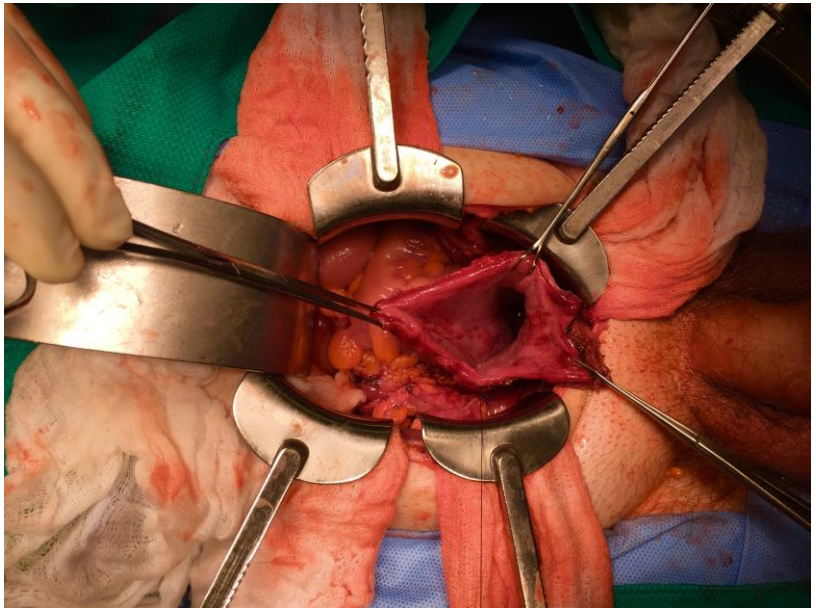
CT Cystogram: Intraperitoneal Rupture

- Extravasated contrast at bladder dome



Treatment:
Intraperitoneal Rupture

- Formal operative repair
- Antibiotics
- Bladder explored
- Two layer closure
- Catheter (two weeks)



Treatment:
Penetrating Trauma

- Explore emergently
- Debridement of devitalized tissue
- 29% associated ureteral injuries
- Drain
- BIG Catheter drainage

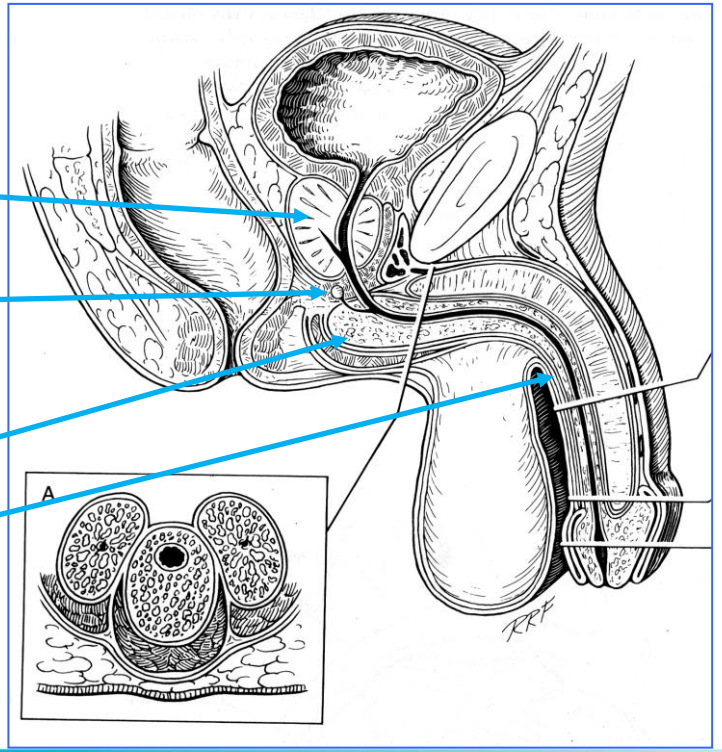
Bladder Trauma: Summary

- Bladder heals well if drained with catheter
- Suspect injury if hematuria and/or pelvic fracture
- Do cystogram to confirm diagnosis
- Extraperitoneal - Conservative Tx
- Intraperitoneal – Formal operative repair

Urethral Trauma

Anatomy: The Urethra

- **Posterior**
  - Prostatic Urethra
  - Membranous Urethra
- **Anterior**
  - Bulbous Urethra
  - Penile Urethra

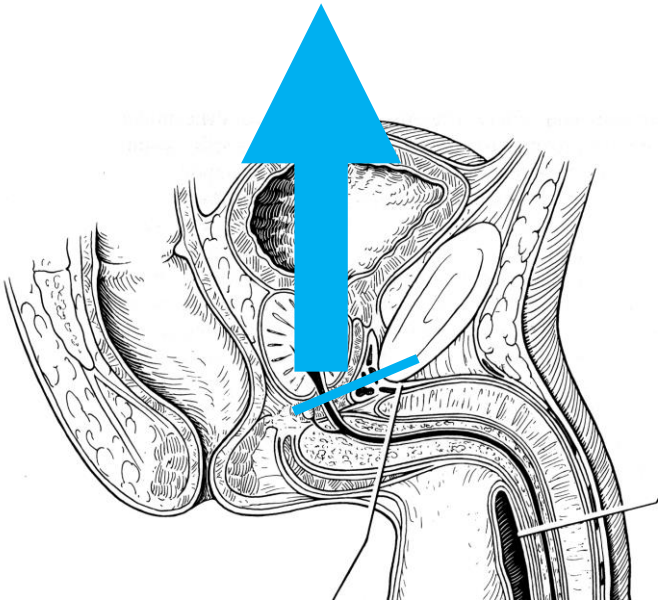


Posterior Urethral Trauma: Epidemiology

- **Occurs with pelvic fractures - "Crush Injury"**
- **MVA (90%)**
- **5% of all pelvic fractures**
- **Signs & Symptoms**
    1) Inability to urinate
    2) Blood at urethral meatus
    3) Gross hematuria
    4) Perineal swelling/hematoma
    5) Non-palpable ("high riding") prostate

Posterior Urethral Distraction

- **Mechanism: Displacement at membranous urethra**

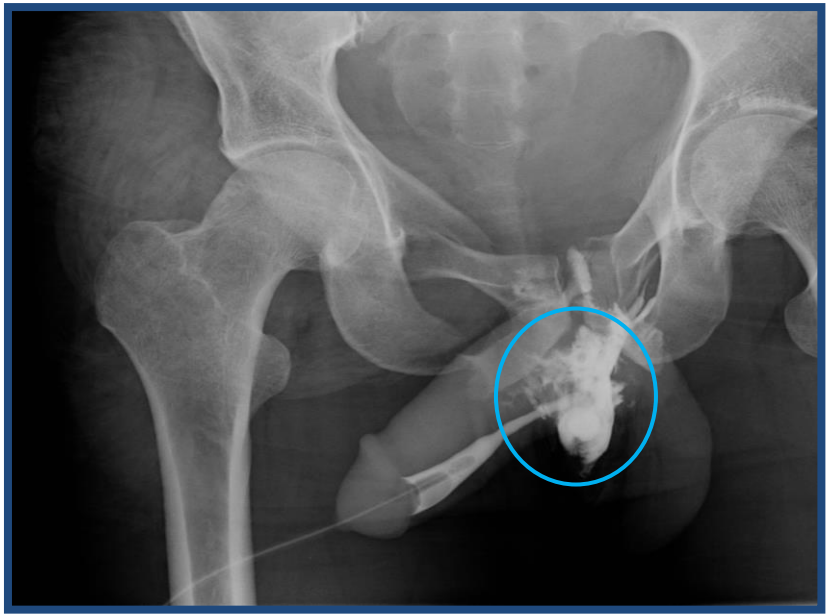


Posterior Urethral Trauma: Important Clinical Point

- DO NOT insert a foley catheter
- Needs a retrograde urethrogram (or flexible scope)

Posterior Urethral Trauma: Diagnosis – Retrograde Urethrogram (RUG)

- Foley 2-3cm into distal urethra
- 1-2mL balloon inflation
- 25 to 35 degree oblique position
- Injection 25-30mL contrast
- Fluoroscopy or standard radiograph



Posterior Urethral Trauma: Complications

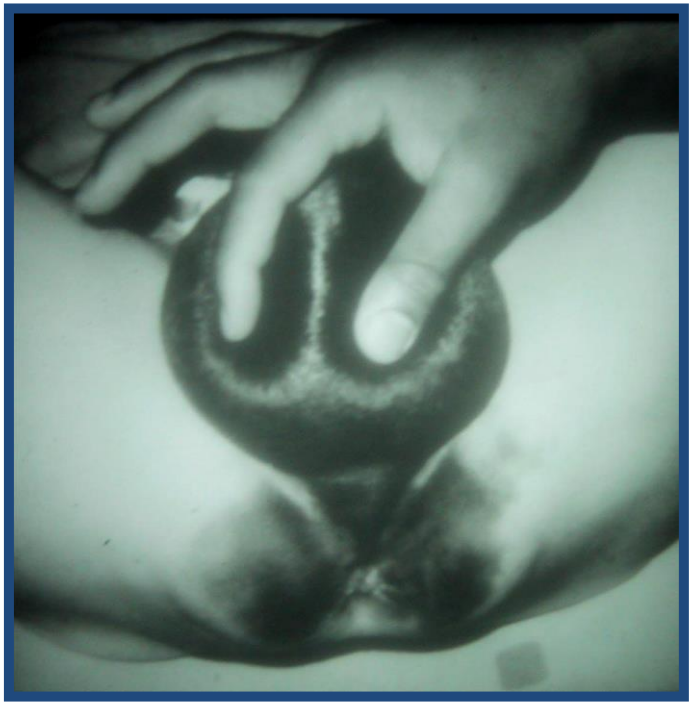
- ❑Abscess
- ❑Stricture
- ❑Incontinence
- ❑Erectile dysfunction

Anterior Urethral Trauma

- **10% of lower GU trauma**
- **More common than posterior injuries**
- **Usually bulbous urethra**
- **Etiology:**
  - Straddle injury
  - Catheter misadventures

Anterior Urethral Trauma: Diagnosis

- Blood at meatus
- If confined to Buck's fascia - "Sleeve of penis" injury
- If not contained within Buck's fascia - "Butterfly pattern" on perineum
- Diagnosis=Urethrogram



External Genital Trauma

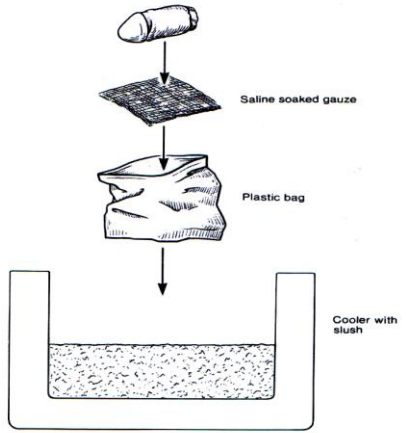
Genital Trauma

1) Penile Amputation
2) Penile Fracture
3) Testicular Fracture

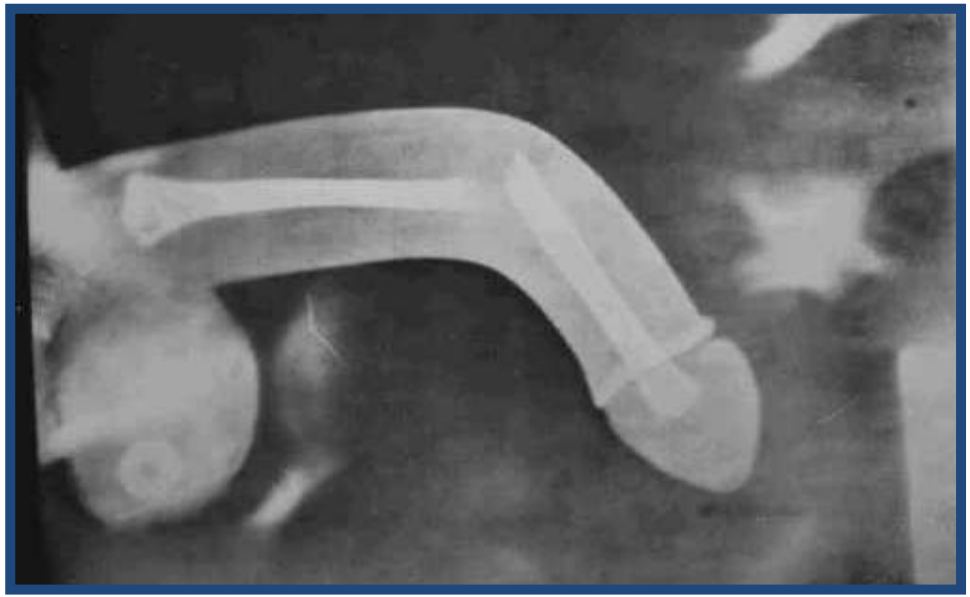
1. Penile Amputation: “Bobbitized”

Penile Amputation

- **Acute psychosis (reversible)**
- **Felonious Assault**
- **Immediate treatment:**
  - Place on ice (in a bag)
- **Microsurgical reimplantation (up to 24 hours)**
- **? Missing pieces**
  - Treat as partial penectomy



Penile Fracture “After the Loving…”

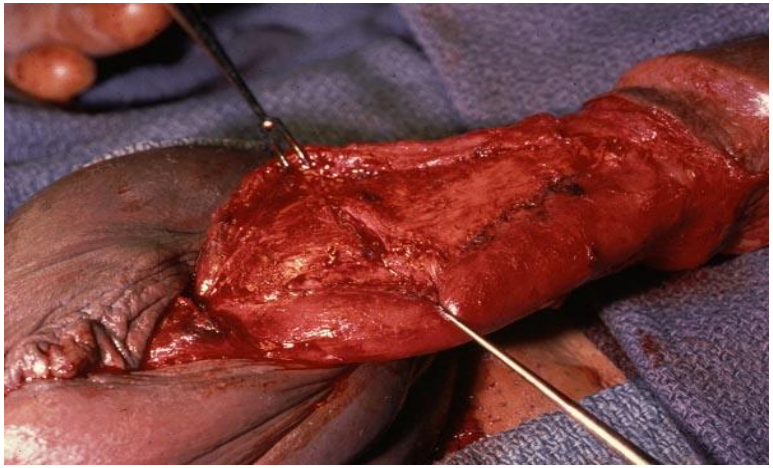


2. Penile Fracture

- **"Disruption of both laminas of the tunica albuginea"**
- **Mechanism**
  - Vigorous intercourse (58%)
  - "Abnormal" bending
- **Clinical Findings**
  - Audible "snap"
  - Pain, immediate detumscence
  - Rapid swelling, displacement
  - Blood at urethral meatus (urethral injury)

Penile Fracture: Treatment

- Surgical exploration is the preferred option
- Primary repair of corporal defect
- Mandatory repair of urethral injury (if present)



3. Testicular Fracture

- Disruption of the tunica albuginea of the testicle
- High velocity injury
- Acute swelling, tenderness
- Ultrasound
  - Scrotal exploration if testicle not definitely intact
- Needs Surgery to Repair