COMMON UROLOGICAL EMERGENCY

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Classification

Traumatic

- Renal Trauma
- Ureteral Injury
- Bladder Trauma
- Urethral Injury
- Penile trauma
- Testicular Trauma

Non traumatic

- Hematuria
- Renal Colic
- Urinary Retention
- Acute Scrotum
- Paraphimosis

NONTRAVMATIC INJURIES

Haematuria – Work-up

History

Examination

Blood tests

Urine tests

Renal U/S

Flexible cystoscopy

IVU / CT scan

Cystoscopy - selected

Treat the cause

Investigation strategy - 1

URINE TESTS	BLOOD TESTS
• MSU – microscopy / culture	• CBC
• Cytology	• Creatinine / electrolytes
	• Calcium / uric acid (in patients with stones)

Investigation strategy - 2

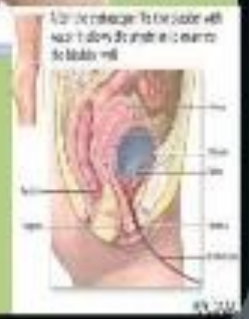
Upper urinary tract (UUT)

Ultrasound →

← IVU

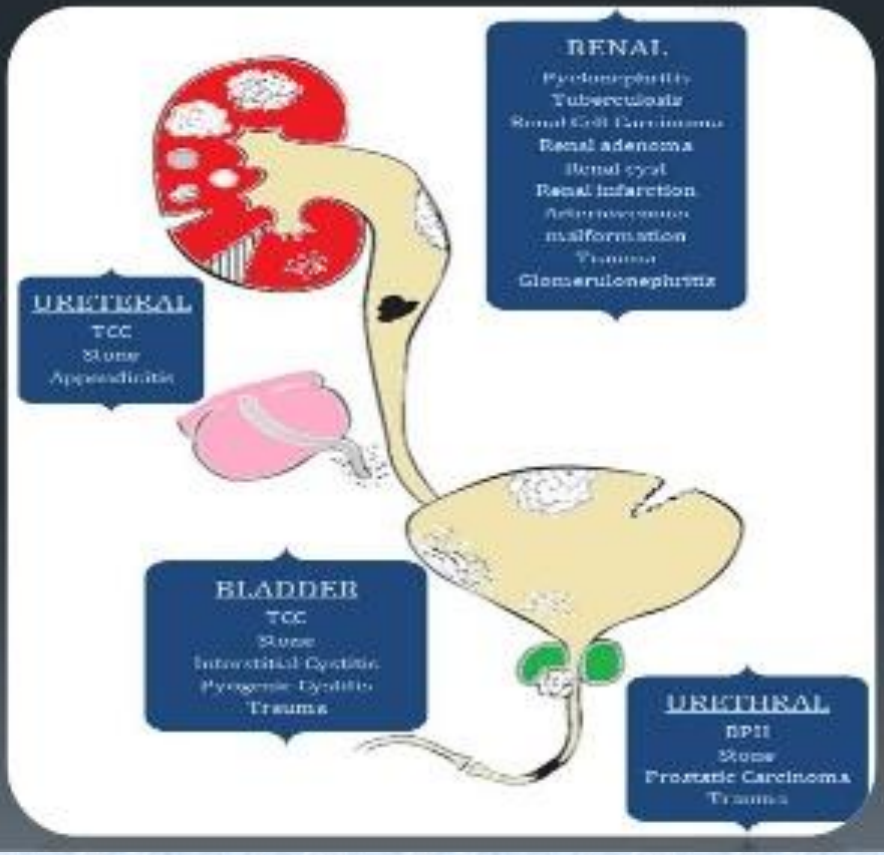
CT scan →

Lower urinary tract (LUT)



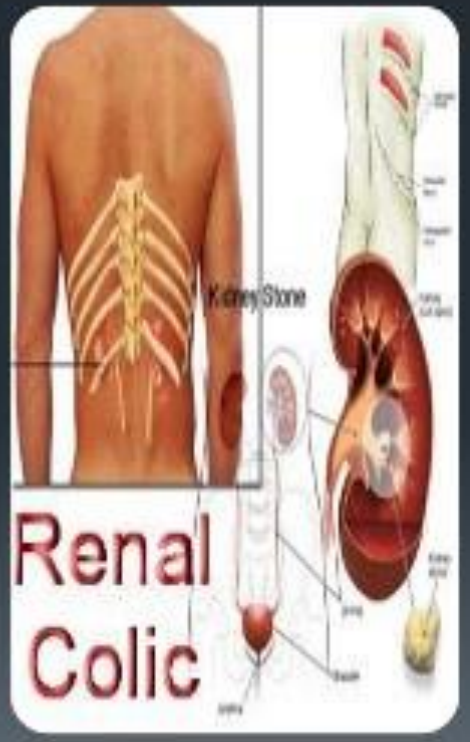
1. Haematuria - Types / Causes

- Early (Initial) : Ure.origin / Distal to ext.sph.
- Terminal : Bladder neck / Prostate origin
- Diffuse (Total) : Source in Bladder / UUT.



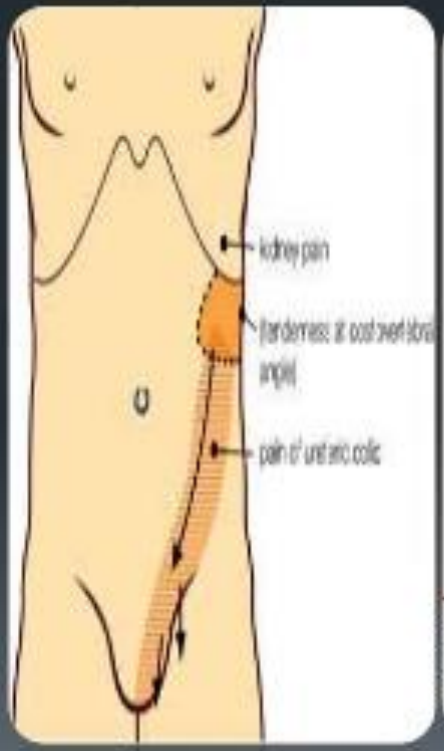
2. Renal Colic

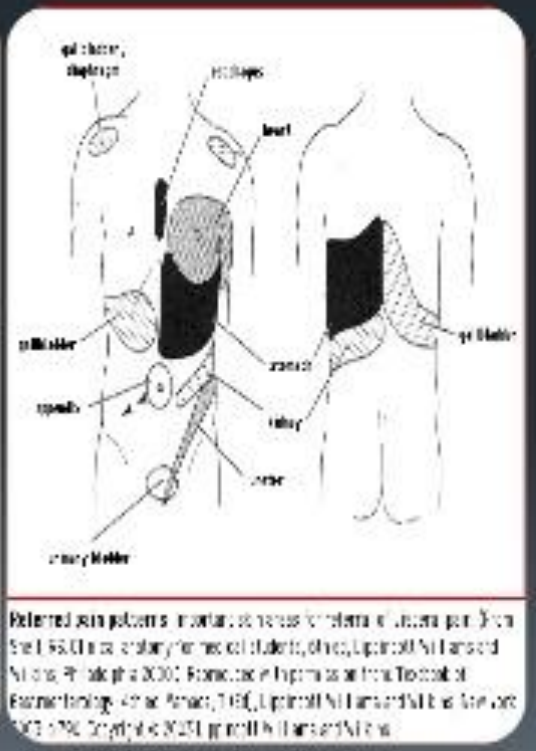
- The commonest urologic emergency.
- One of the commonest causes of the "Acute Abdomen".
- Sudden onset of severe pain in the flank.
- Most often due to the passage of a stone formed in the kidney, down through the ureter.



Renal Colic

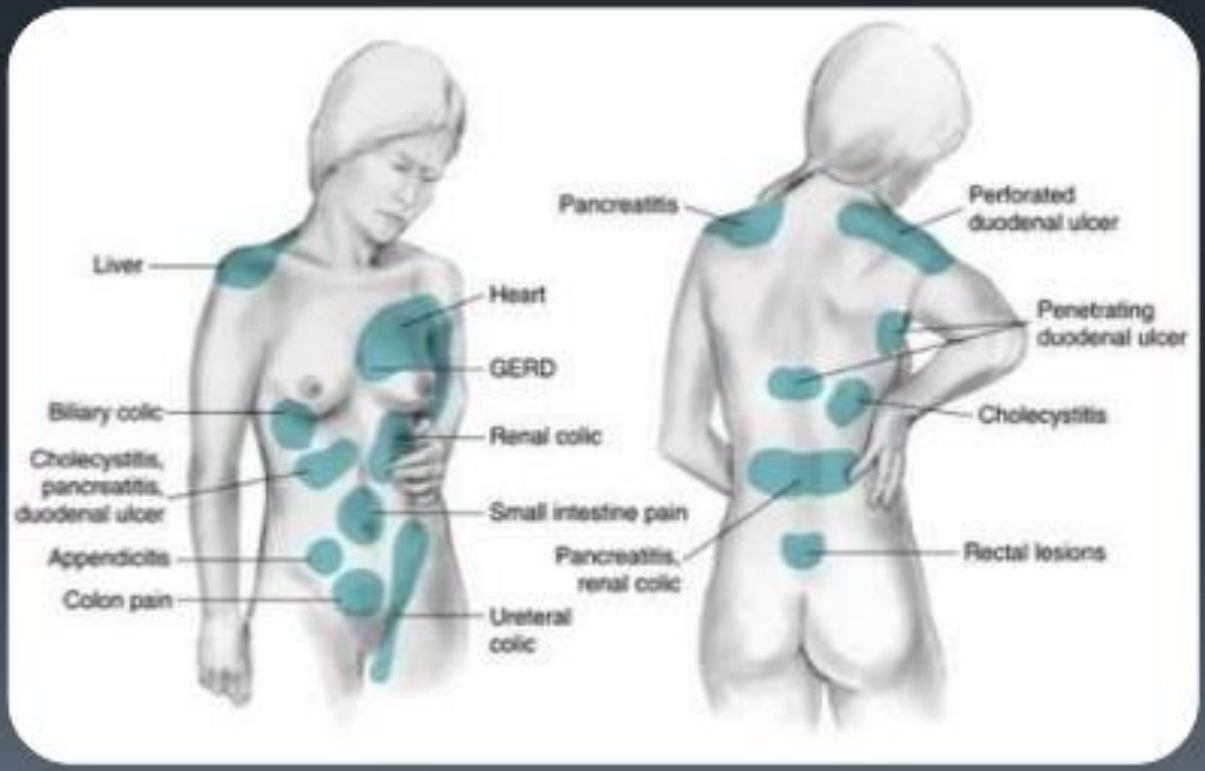
- When caused by acute obstruction of the renal pelvis, is typically fixed deep in the loin and 'bursting' in character.
- When caused by acute ureteric obstruction (usually by a stone), is colicky with sharp exacerbations against a constant background.
- Is liable to be referred to the groin, scrotum or labium as the calculus obstruction moves distally.





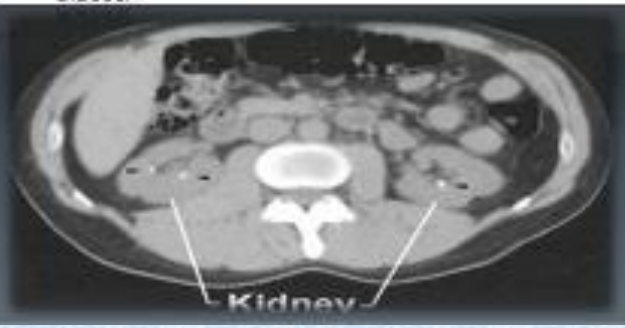
Renal Colic – D / D

- Pyelonephritis
- Abdominal aortic aneurysm
- Appendicitis
- Biliary colic (gallstones)
- Peritonitis
- Diverticulitis
- Salpingitis
- Torsion - ovarian cyst
- Ectopic pregnancy
- Shingles



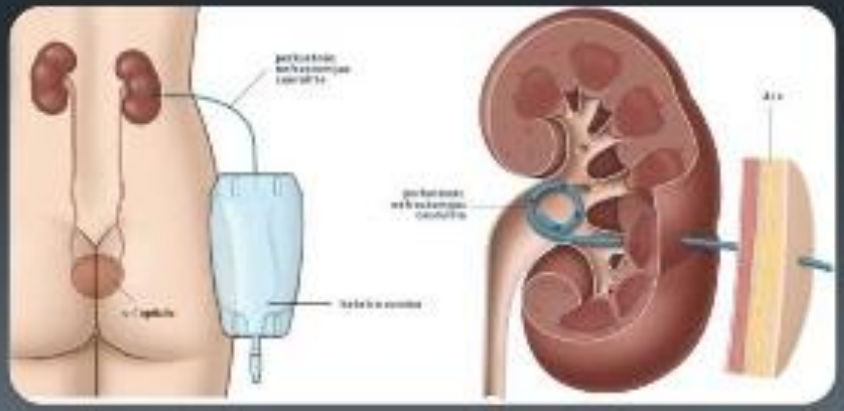
Renal Colic – Work up

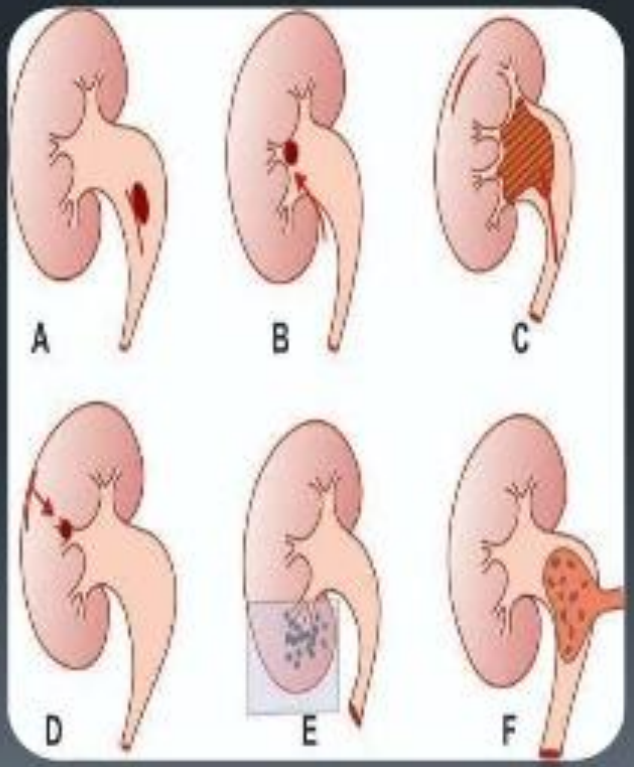
- History
- Examination
- Pregnancy test
- MSU
- X-ray KUB / U/s – Abd
- IVP / CT scan



Renal Colic – Renal stones - Treatment

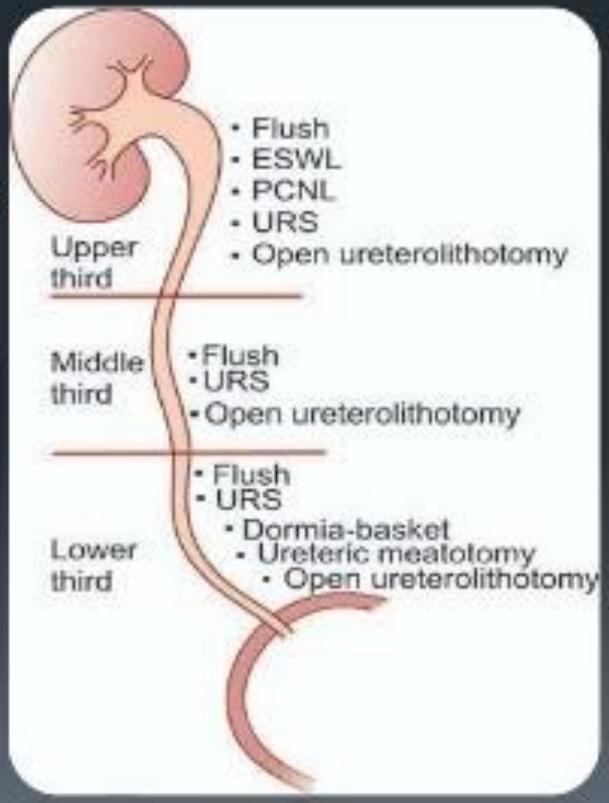
- Calculi smaller than 0.5 cm pass spontaneously
- Pain relief - NSAIDs
- IV – Fluids
- Most calculi are treated by MAT
- PCNL / ESWL / URS





Renal Colic – Ureteric stones - Treatment

- Oral fluids – plenty
- Pain relief - NSAIDs
- Flush therapy – IV Fluids + Diuretic
- Site of Stone

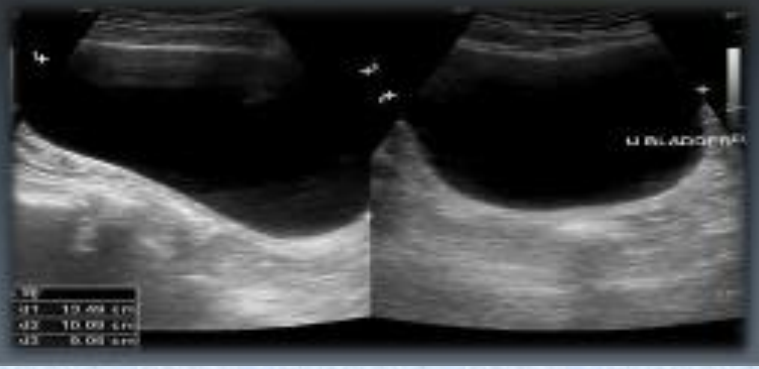


3. Urinary Retention

- Painful inability to void, with relief of pain following drainage of the bladder by catheterization.

Pathophysiology :

- Increased urethral resistance, i.e., bladder outlet obstruction (BOO).
- Low bladder pressure, i.e., impaired bladder contractility.
- Interruption of sensory or motor innervations of the bladder.



Urinary Retention

Men

- BOO (commonest cause)
- Urethral stricture
- Acute urethritis or prostatitis
- Phimosis

Women

- Pelvic prolapse (cystocoele, rectocoele, uterine)
- Post surgery for 'stress' incontinence
- Pelvic masses (e.g., ovarian masses)
- Bladder neck obstruction (rare)

Both

- Blood clot
- Urethral calculus
- Rupture of the urethra
- Neurogenic
- Smooth muscle cell dysfn. (associated with ageing)
- Faecal impaction
- Anal pain (haemorrhoidectomy)
- P O analgesic treatment
- Drugs
- Spinal anaesthesia

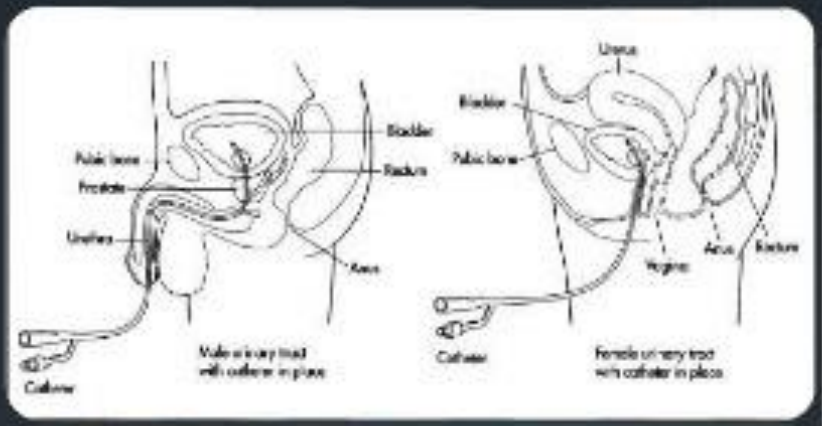
Urinary Retention - MGT

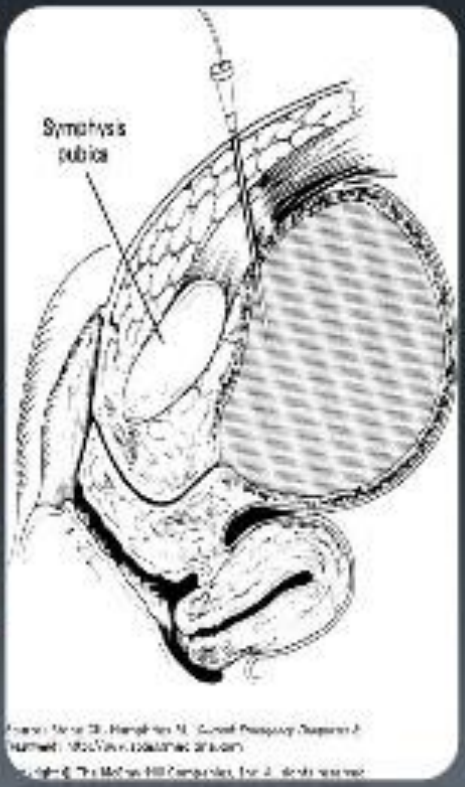
Initial Management :

- Urethral catheterization
- Suprapubic catheter (SPC)

Late Management:

- Treating the underlying cause





4. Acute Scrotal Conditions

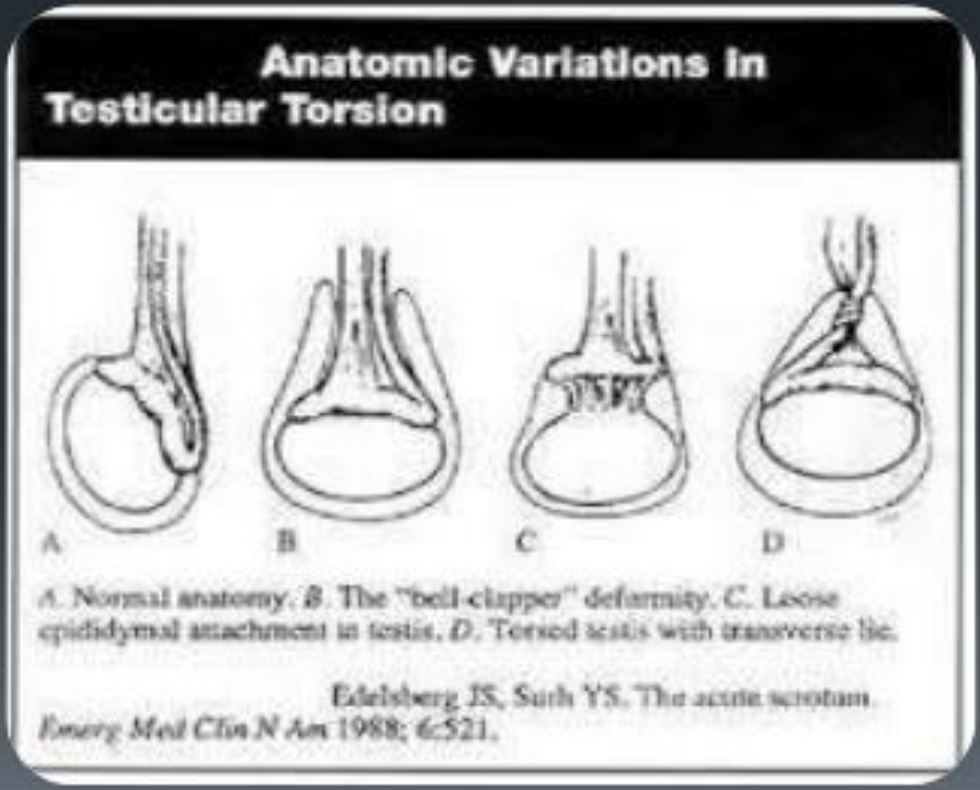
- Emergency situation requiring prompt evaluation, differential diagnosis, and potentially immediate surgical exploration.
- Testicular Torsion - Most serious.
- Torsion of the Testicular and Epididymal Appendages.
- Epididymo-orchitis - Most common

Table 67–2. DIFFERENTIAL DIAGNOSIS OF THE ACUTE/SUBACUTE SCROTUM

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
Varicocele
Nonurogenital pathology (e.g., adductor tendinitis)

4-a. Torsion Testis

- Inversion of the testis - most common predisposing cause. The testis is rotated so that it lies transversely or upside down.
- High investment of the tunica vaginalis causes the testis to hang within the tunica like a "*clapper in a bell*".
- Gap between epididymis & the body of the testis permits the testis to twists over epididymis.
- Heavy straining – vig.contraction of cremaster – attached spirally.



Torsion Testis

- It is most common between 10 and 25 yrs.
- Symptoms vary with the degree of torsion.
- Signs related to Torsion –

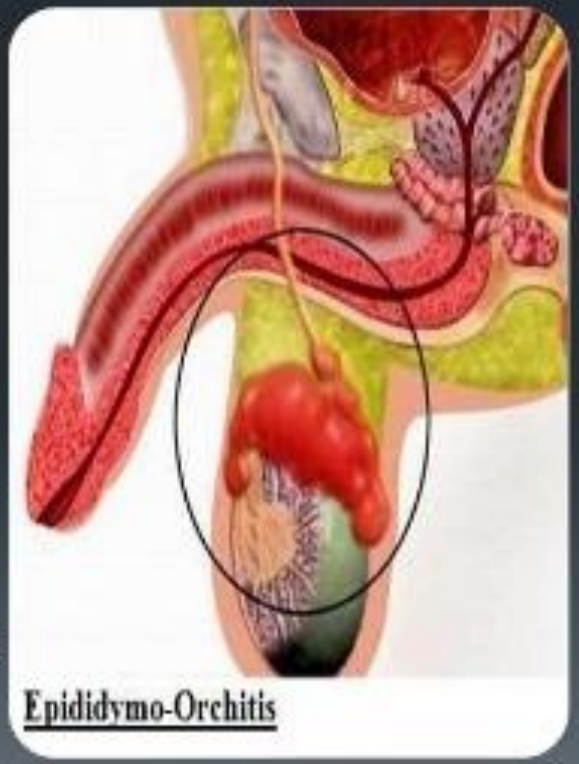
  Deming's / Angell's / Prehn's sign
- Right testis rotates in clockwise direction where as Left testis rotates in anticlockwise.
- Doppler ultrasound scan - confirm the absence of the blood supply to the affected testis.
- If there is any doubt about the diagnosis, the scrotum should be explored.

Torsion Testis

- Prompt exploration, untwisting and fixation is the only way to save the torted testis.
- The patient should be counselled and consented for orchidectomy before exploration.
- The anatomical abnormality is bilateral and the contralateral testis should also be fixed.
- Other structure in scrotum which can undergo torsion is 'Appendage of testis'.

4-b. Epididymo-orchitis - Acute

- Infection reaches the epididymis via the vas.
- Mode of infection.
- Dysuria & fever is more common
- Scrotal swelling / tender & thickened epididymis.
- Secondary hydrocele may be present.
- Urine : pyuria, bacteriuria, or a positive urine culture (Gram-negative bacteria)



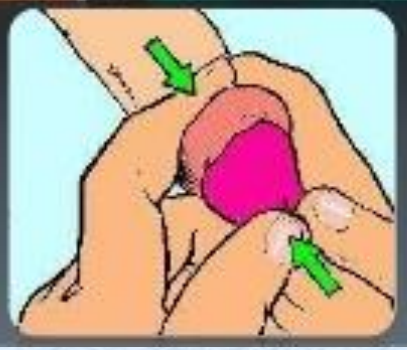

This young boy with epididymitis has left scrotal swelling.

Epididymo-orchitis

- Bed rest for 1 to 3 days then relative restriction.
- Scrotal elevation, the use of an athletic supporter.
- Parenteral antibiotic therapy should be instituted when UTI is documented or suspected.
- Reassurance – required.

5. Paraphimosis

- Inability to place back the retracted prepucial skin over the glans.
- Constriction ring proximal - to corona & prepuceal skin.
- Glans will be swollen / oedematous with severe pain and tenderness.
- Icebags, gentle manual reduction and injection of a solution of hyaluronidase in normal saline may help to reduce the swelling.
- If manipulation fails circumcision is done.

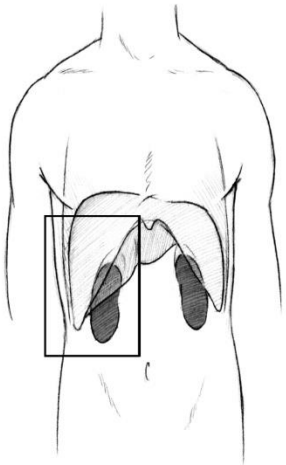


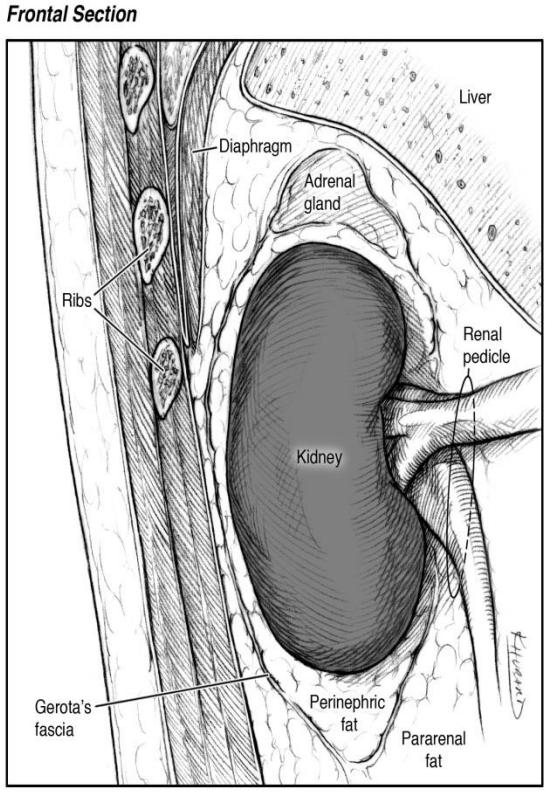
TRAVMATIC INJURIES

Renal Trauma

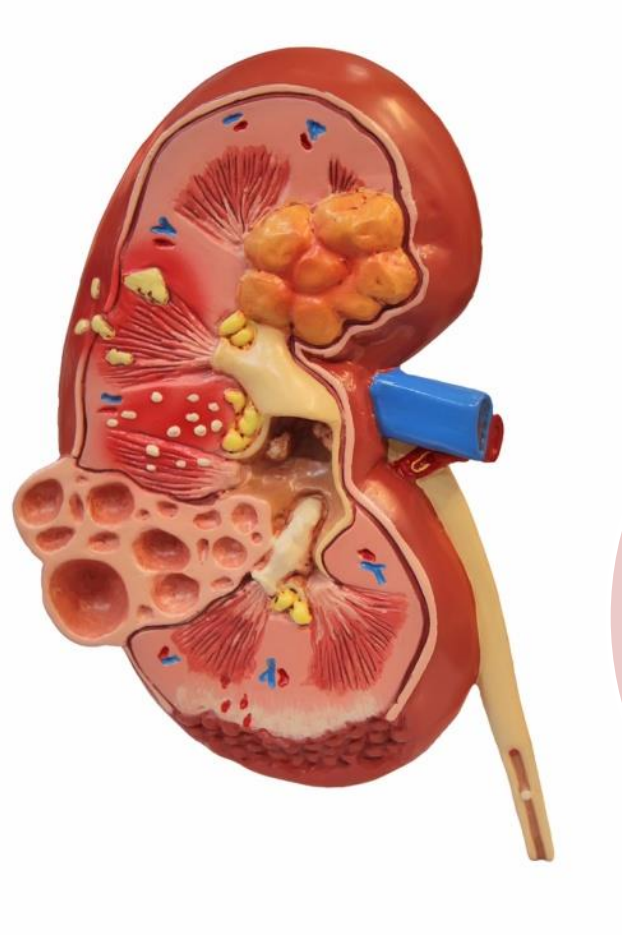
Renal Anatomy

- Retroperitoneal
- Adjacent to lower two thoracic and first four lumbar vertebrae
- Upper poles protected by ribs so lower poles more commonly injured
- Right kidney inferior to left and more commonly injured
- Kidney mobile, hilum more fixed—concern with shearing injury with deceleration





Renal Trauma



Occurs in 8-10% of patients with abdominal trauma

Accounts for 50% of all GU trauma

Most common organ damaged by blunt trauma in the pediatric population

Renal Trauma

- 10% of abdominal injuries involve the kidneys
- Renal trauma is the most common GU injury—65% of GU injuries
- Mechanism
  - 80-95% due to blunt force— falls, assaults, sporting events

Background

- If injury to GU system identified, multi-organ injury is the rule.
- Examples:
  - If renal injury found following penetrating trauma, 80-95% chance of other significant injury
  - If renal injury found following blunt trauma, 75% chance of other significant injury found
- Other injuries may be more immediately life threatening and therefore
- GU injury diagnosis may be overlooked or delayed

When are you concerned about renal injuries?

- Mechanism of Injury
  - Penetrating injuries of abdomen, back or flank
  - Deceleration injuries
- Physical exam
  - Tenderness of abdomen or flank
  - Ecchymosis of abdomen or flank
- Xray
  - Fractures of lower ribs, thoraco-lumbar spine

Mechanism of Injury - Blunt

- Suspect some type of renal injury if fractures of the posterior ribs or lumbar vertebrae are present
- Acceleration -Deceleration forces may cause damage to the renal vasculature

Mechanisms of Injury - Penetrating

When are you concerned about renal injuries?

- Hematuria—over 95% of patients with renal trauma will have some degree of hematuria (>5 rbc/hpf)
- THE PRESENCE OR DEGREE OF HEMATURIA DOES NOT CORRELATE WITH THE SEVERITY OF THE INJURY
  - 25% of patients with gross hematuria have minor injuries
  - 40% of the most serious renal injuries do not have any hematuria

Physical Assessment

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

When is Imaging Indicated ?

- Penetrating trauma
- Pediatric trauma
  - Blunt > 50 rbc's
- Deceleration injury
- Adult blunt trauma
  - Gross hematuria
  - Microhematuria & shock (sbp<90)

Imaging techniques

- **Contrast enhanced CT—the best test, up to 98% accurate, not great for renal vein injuries**
- IVP—perhaps useful in the OR to determine function of contralateral kidney before contemplated nephrectomy
- Angiography—better than CT for defining injuries to renal artery and vein, also used therapeutically to embolize or stent artery injury
- Ultrasound—30% false negative rate for injury, used to look for two kidneys, free fluid
- Contrast Enhanced Ultrasound—perhaps
- MRI—not first line due to time, sensitivity similar to CT, can be used for follow up studies

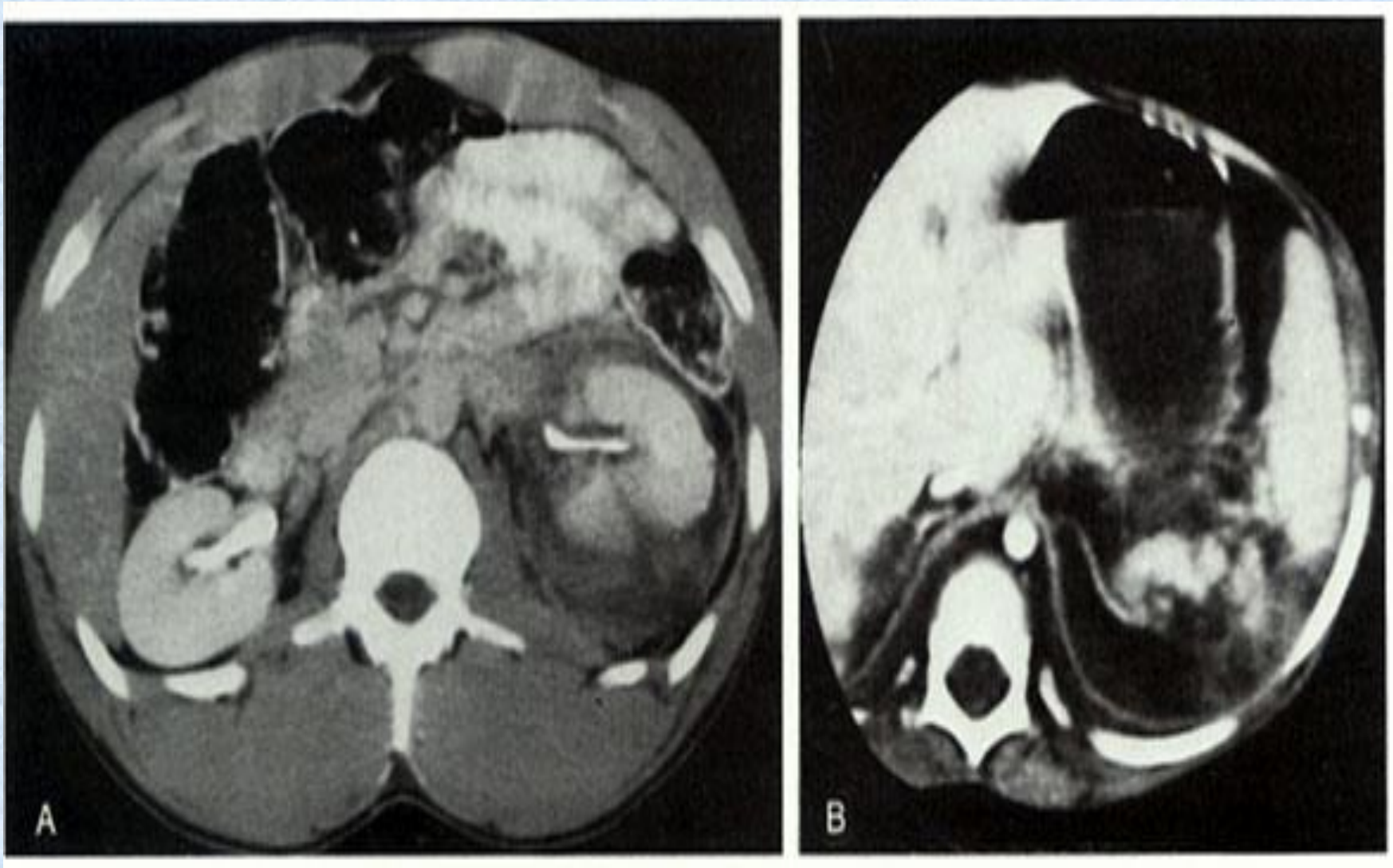
Radiology

- IVP: 1.5 – 2ml/kg bolus IVP preferred
  - This study is adequate 60-85% of the time
  - Abnormal findings often require further imaging
  - "single shot" IVP is discouraged

  <u>CT with IV contrast is procedure of choice</u>

Why is CT the Best Imaging Study?

- Accurate staging
- Non-invasive
- Detects associated injuries
- Rapid
- Need contrast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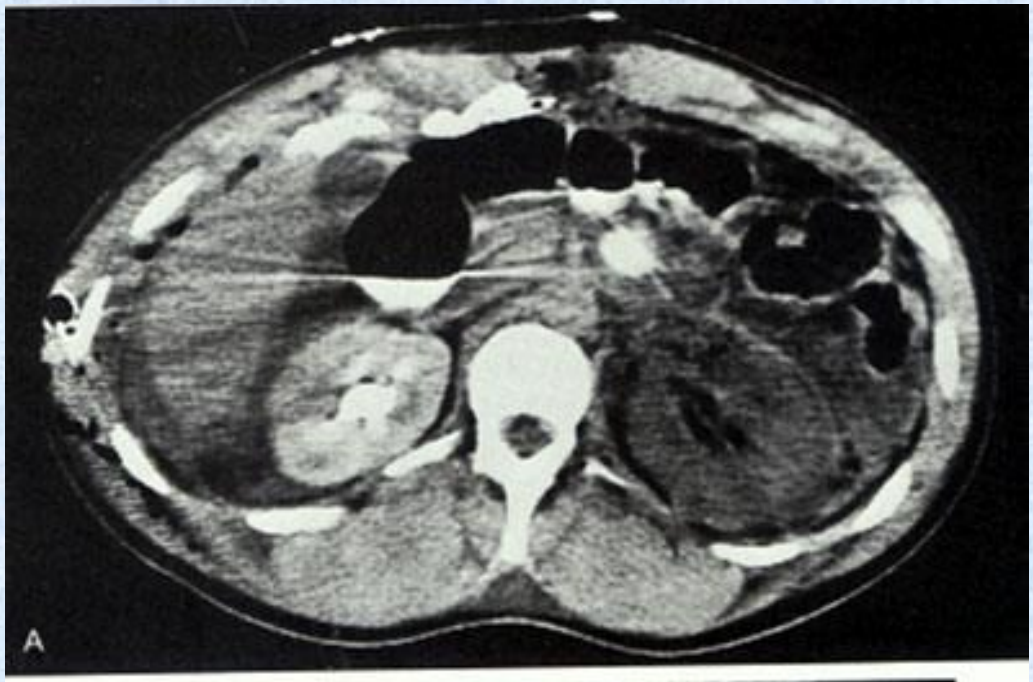
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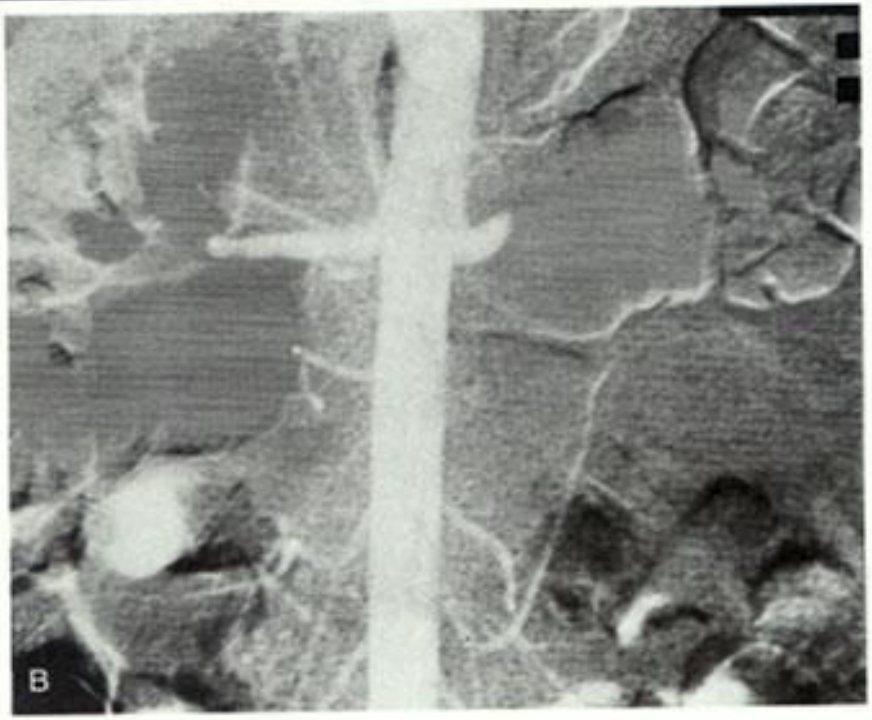
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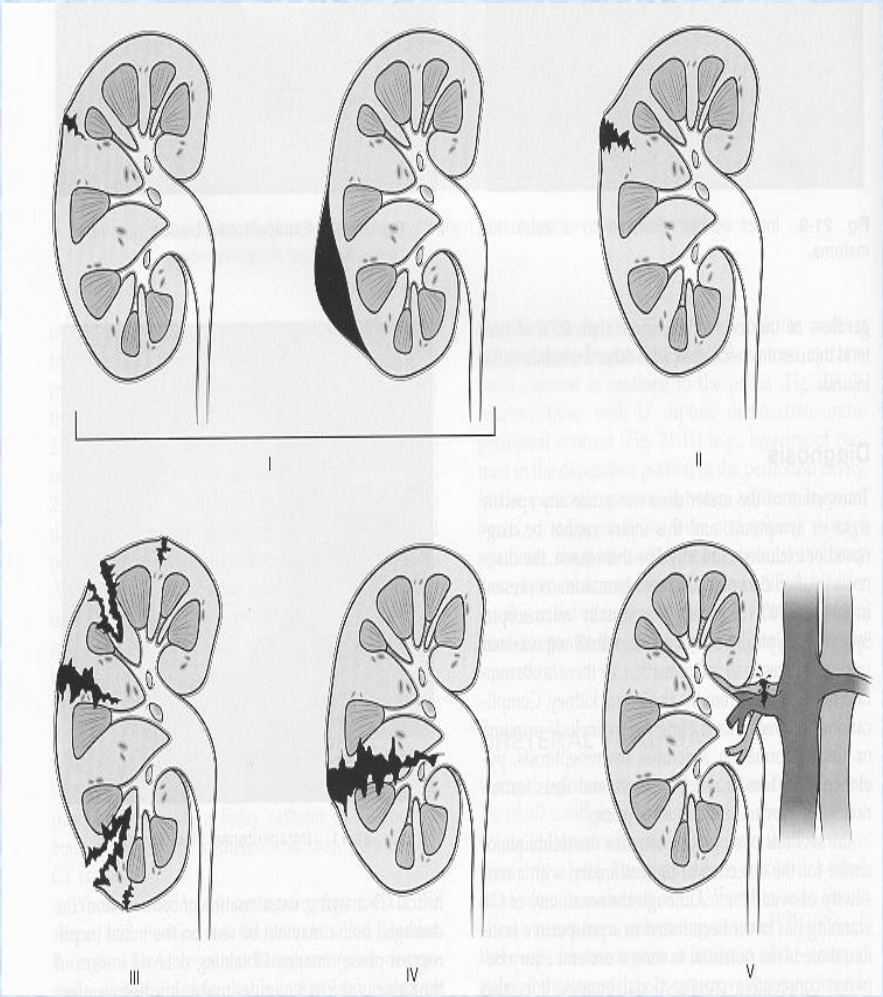
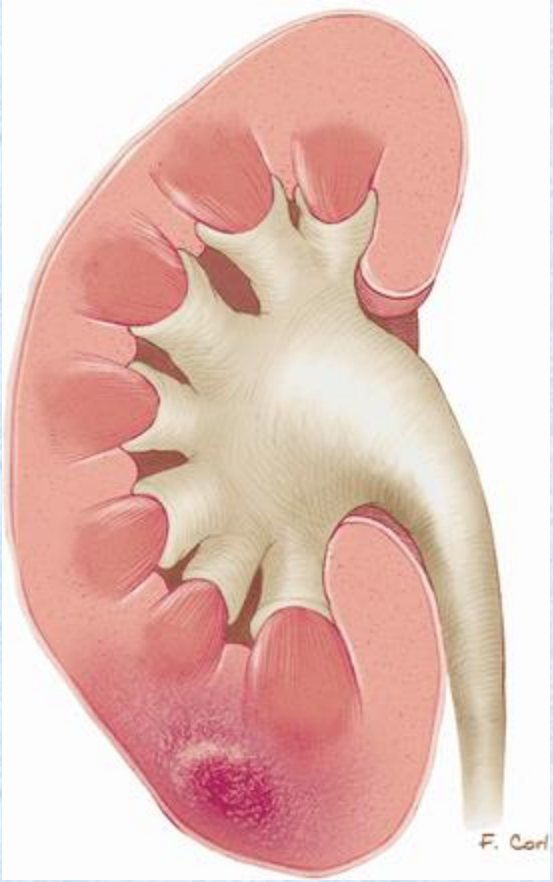
AAST Kidney Injury Severity Scale



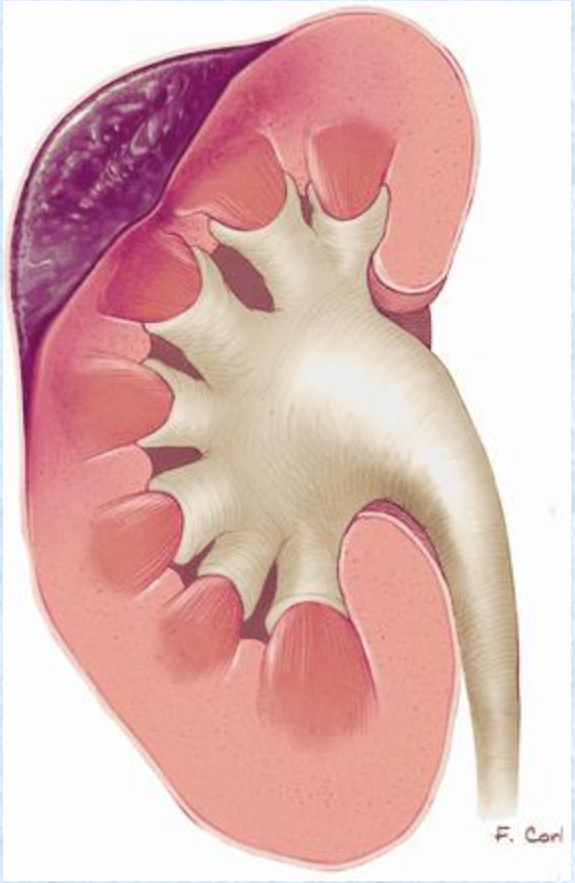
Renal Injury Scale

Grade I	Contusion / Subcapsular hematoma No parenchymal laceration
Grade II	Laceration < 1 cm depth of renal cortex No urinary extravasation
Grade III	Laceration > 1 cm depth of renal cortex No urinary extravasation
Grade IV	Laceration extending through renal cortex, medulla and into collecting system Minor renal artery or vein injury with contained hematoma
Grade V	Shattered kidney Devascularized kidney, hilar avulsion

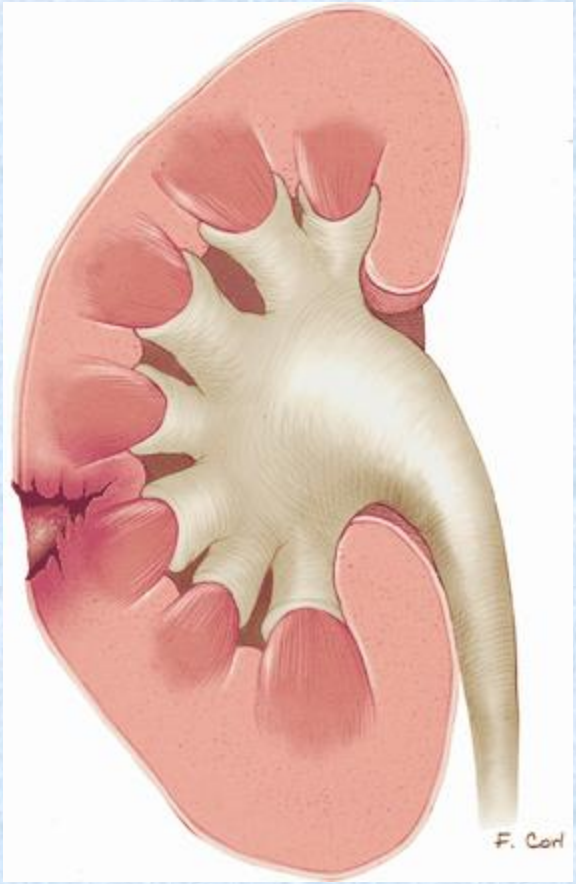
Grade I-Renal contusion



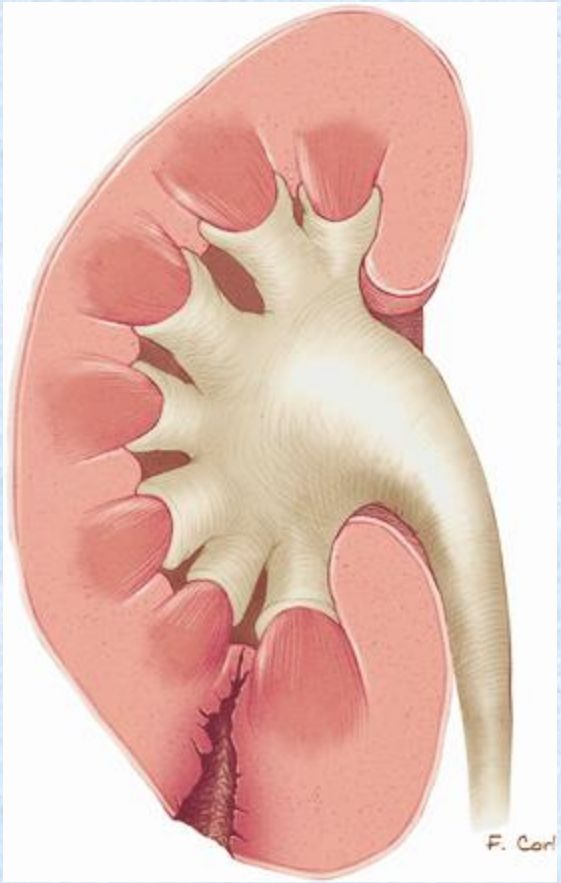
Grade I-Subcapsular Hematoma



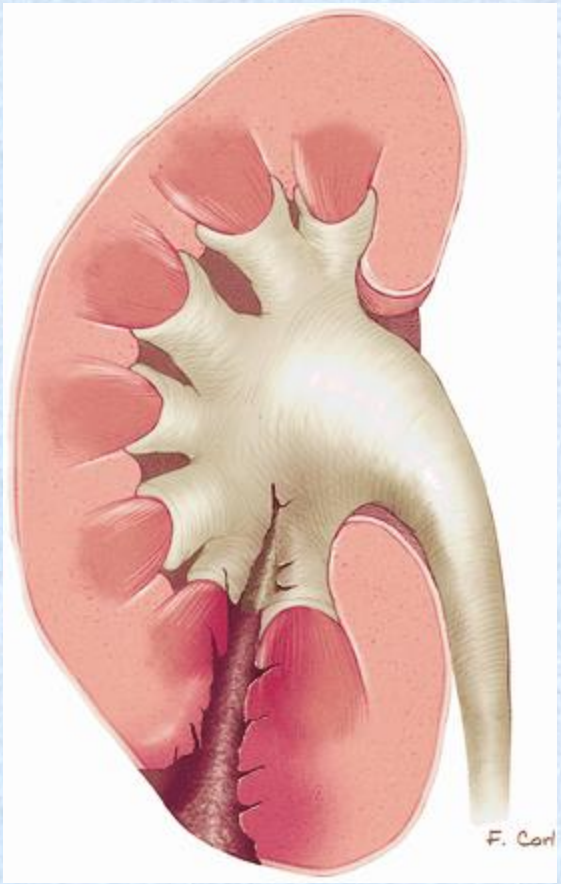
Grade II-Small Cortical Laceration



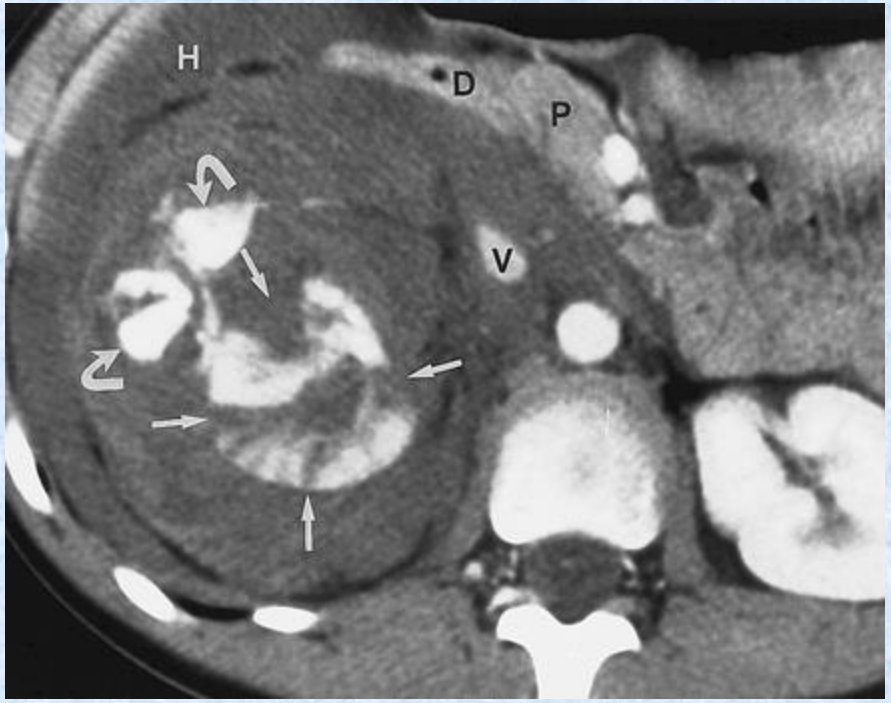
Grade III-Major Renal Laceration



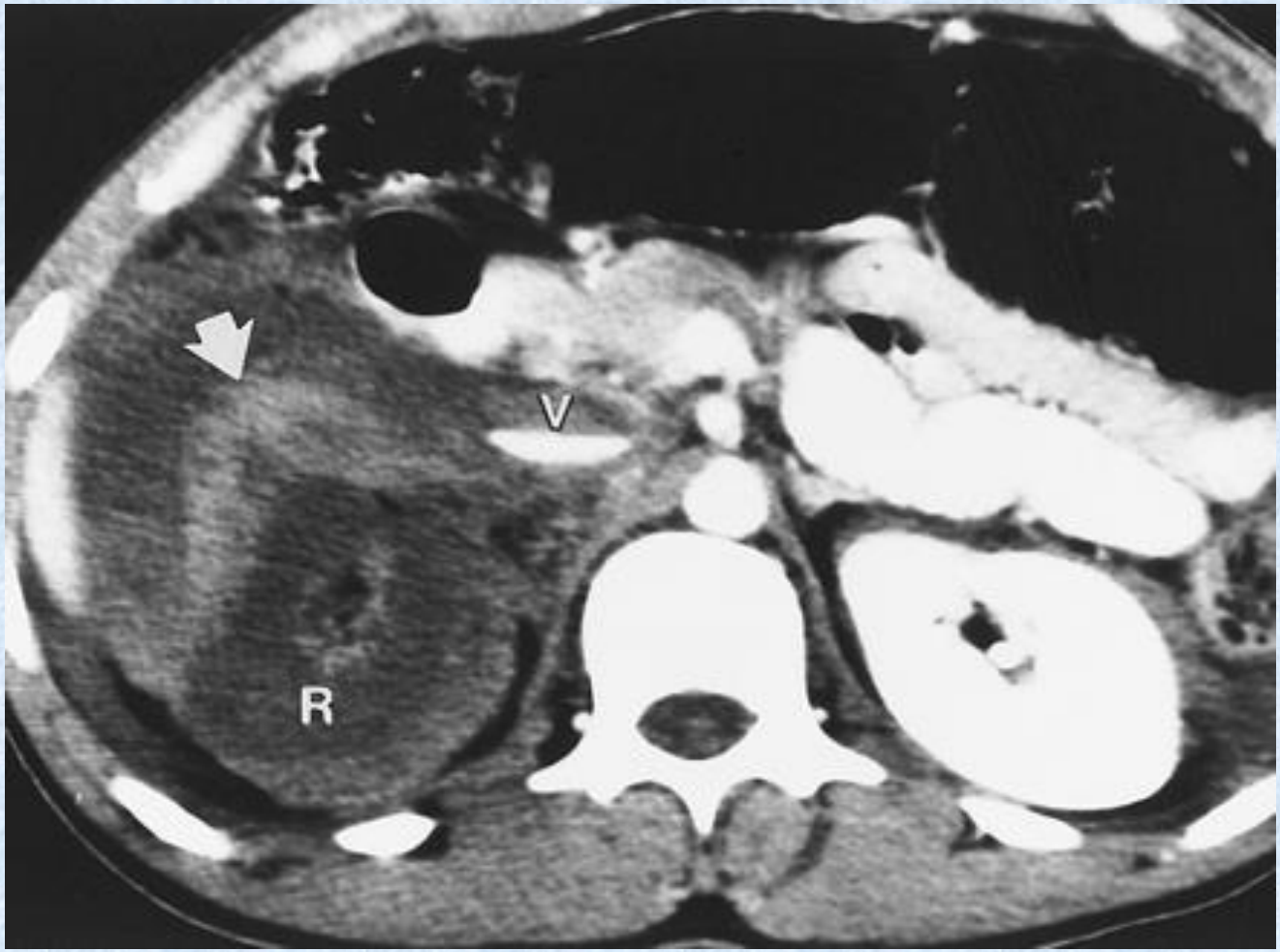
Grade IV-Major Laceration involving Collecting System



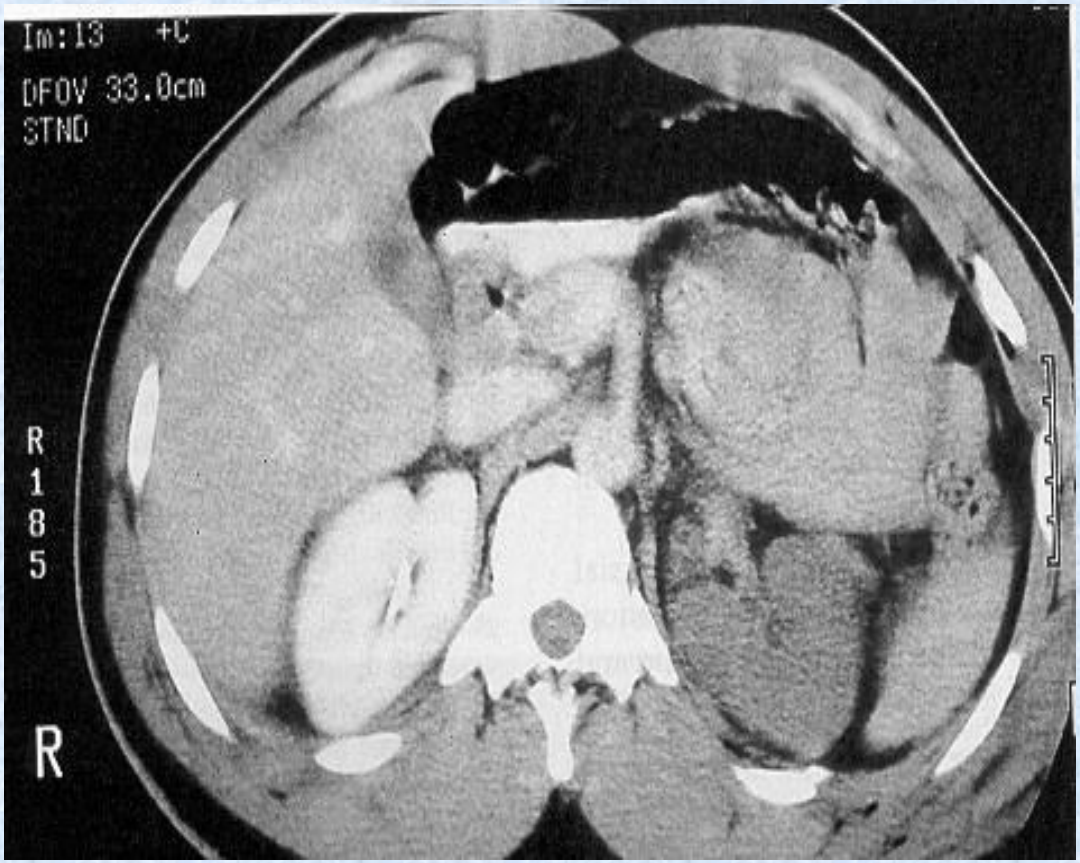
Grade IV- Multiple Renal Lacerations

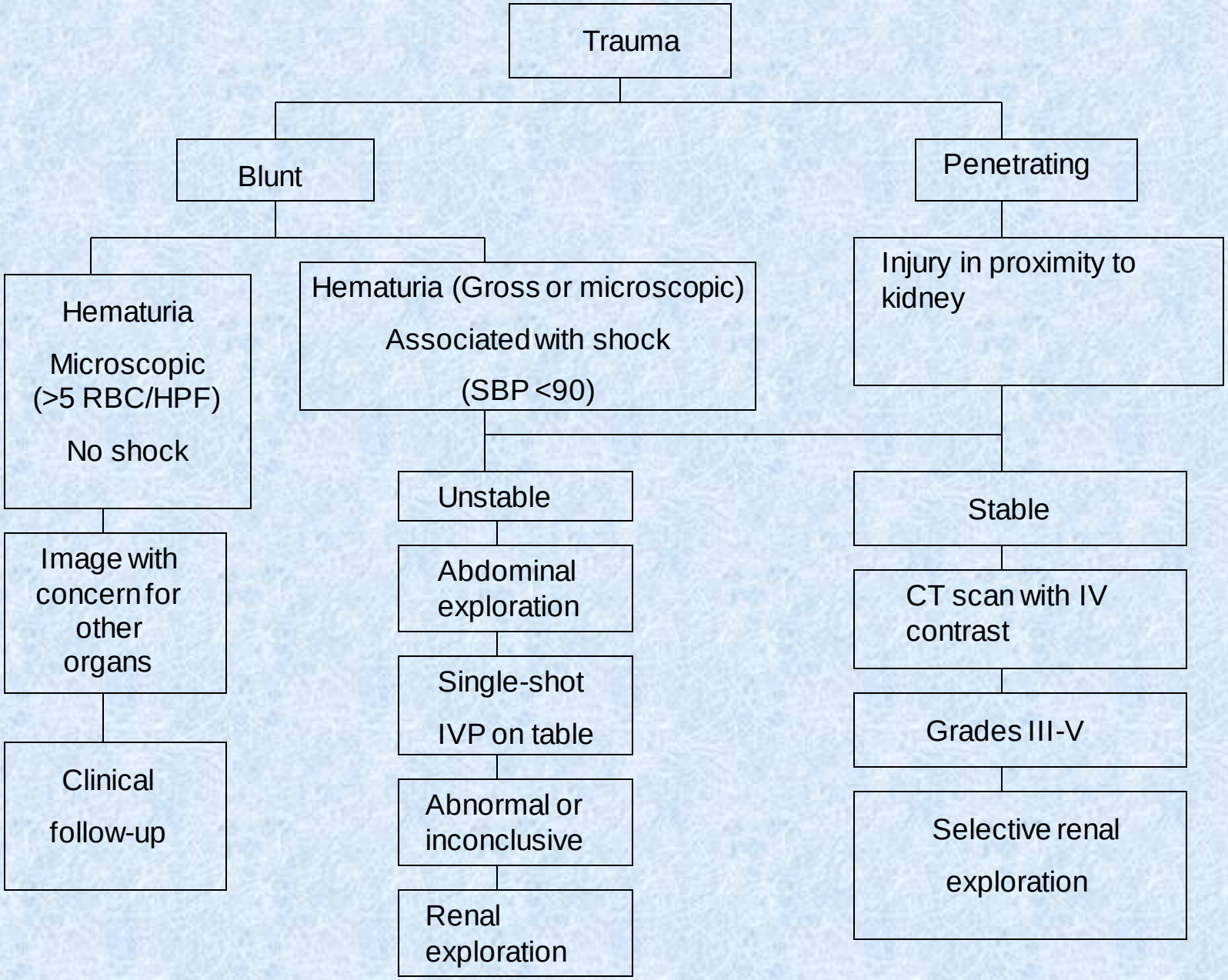


Grade IV-“Shattered” Kidney



Grade V- Avascular Left Kidney




Trauma
Blunt
Penetrating
Hematuria
Microscopic
(>5 RBC/HPF)
No shock
Hematuria (Gross or microscopic)
Associated with shock
(SBP <90)
Injury in proximity to kidney
Image with concern for other organs
Clinical follow-up
Unstable
Abdominal exploration
Single-shot IVP on table
Abnormal or inconclusive
Renal exploration
Stable
CT scan with IV contrast
Grades III-V
Selective renal exploration

Blunt Injury

- Adults with less than 3-5 RBC/hpf or children with less than 50 RBC/hpf can be discharged from ED with close follow up
- Only 1-2% of injuries involve the pedicle, but salvage rate is only 15-20%
- Renal injuries are more common, result from deceleration tend to be partial tears

Blunt Injury

- Venous injuries tend to bleed more
- CT scan will diagnosis most arterial injuries, venous injuries diagnosed indirectly due to large hematoma
- Renal lacerations account for 2-4% of all renal injuries, diagnosed by CT

Management of Renal Injuries

- Grade I—home
- Grade II-IV—admit, observe
- Grade V—observe, vascular repair/stent, or nephrectomy

Only absolute indications for surgery are persistent renal bleeding with hemodynamic instability, active extravasation of IV contrast, expanding or pulsatile perirenal hematoma suggesting Grade V vascular injury

Blunt Injury

- Surgical repair controversial
- Minor renal lacerations/contusions managed expectantly

Penetrating Injuries

- Hematuria is of no consequence as all patients need CT, most will need surgery

Complications of Renal Injuries

- Mortality 3%
- Complications
  - First six weeks
    - Hemorrhage/shock
    - Sepsis/abscess
    - ATN
  - Late
    - Renovascular HTN 1-4%

Complications

- Renovascular HTN in 1% associated with pedicle injuries and failed arterial repairs

Renal Trauma Complications

- Sepsis
- Decreased H/H
- Expanding perirenal mass
- Hemodynamic instability

- Abscess/urinomas
- Sepsis
- Fistula
- Renal atrophy
- Rhabdomyolysis/myoglobinuria
- Renal HTN
- Renal Failure

Renal Trauma Complications

- **Rhabdomyolysis-Myoglobinuria**
  - From direct or indirect muscle injury
  - Myoglobinuria is a marker of rhabdomyolysis
  - Renal tubulotoxic effect
  - Manage with diuresis and alkalinization of urine

Complications of Renal Trauma

Post-Traumatic HTN

- Caused by excess of renin excretion, infarct, and renal scarring
- Can occur in 0-33 % of renal trauma cases
- Most are managed conservatively with a low-dose medication regimen

Acute Renal Failure (ARF)
Prerenal Failure

Prerenal ARF

- Etiology
  - Profound hypotension
  - Inadequate kidney perfusion without actual renal damage

Diagnostics

- Urine sodium < 10 mEq/L
- Fractional sodium excretion < 1%
- Specific gravity > 1.020
- Increase BUN > creatinine
- Minimal or no proteinuria
- Possible myoglobinuria

Acute Renal Failure (ARF)
Intrarenal Failure

Etiology

- Direct insult to renal parenchyma
- Cortex injury due to infection, autoimmune disease, hypertension
- Medullary injury due to nephrotoxins, prolonged ischemia, rhabdomyolysis
- Acute damage to renal capillary bed and tubules

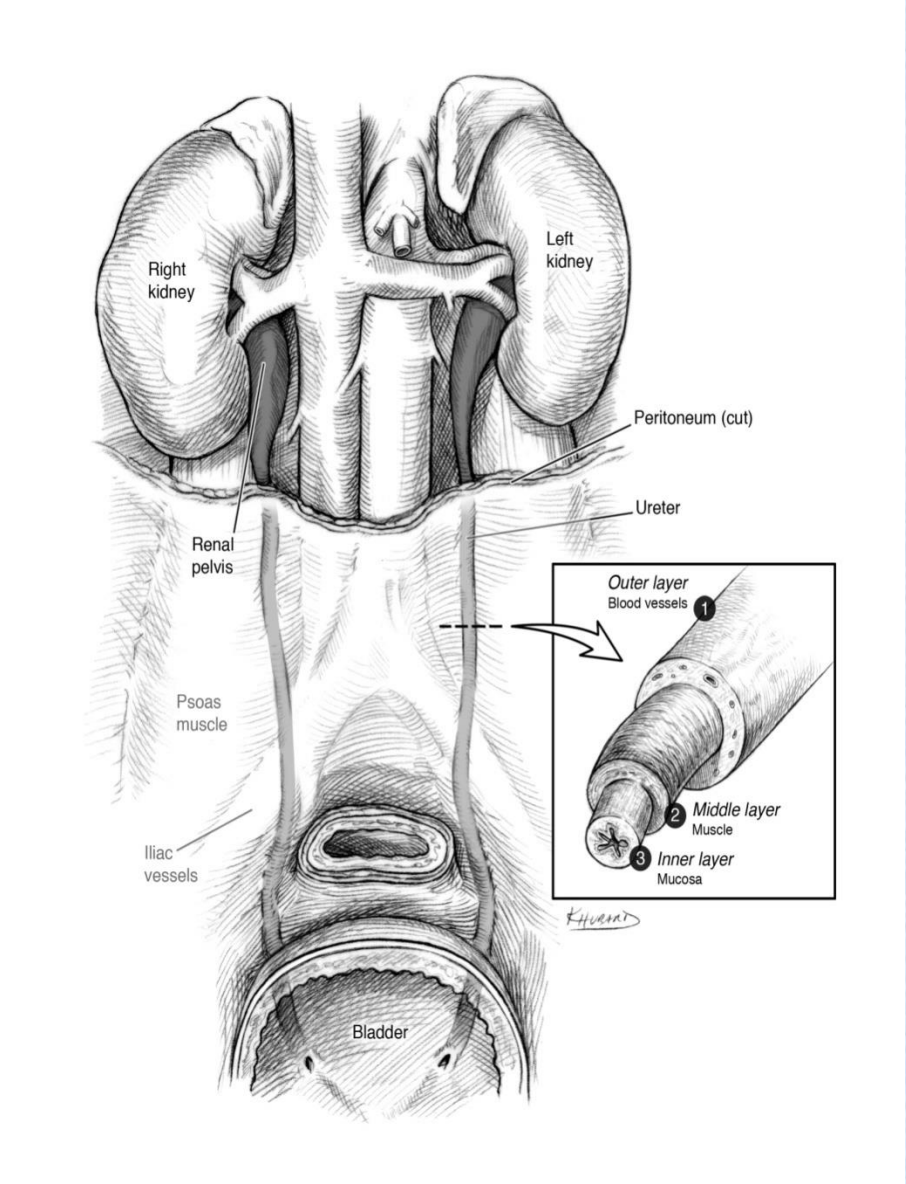
Diagnostics

- Abnormal specific gravity
- Fractional excretion of sodium > 1%
- Elevation BUN and creatinine
- Decreased creatinine clearance
- Proteinuria
- High urine sediment
- Possibly myoglobinuria

Ureteral Trauma

Ureteral Anatomy

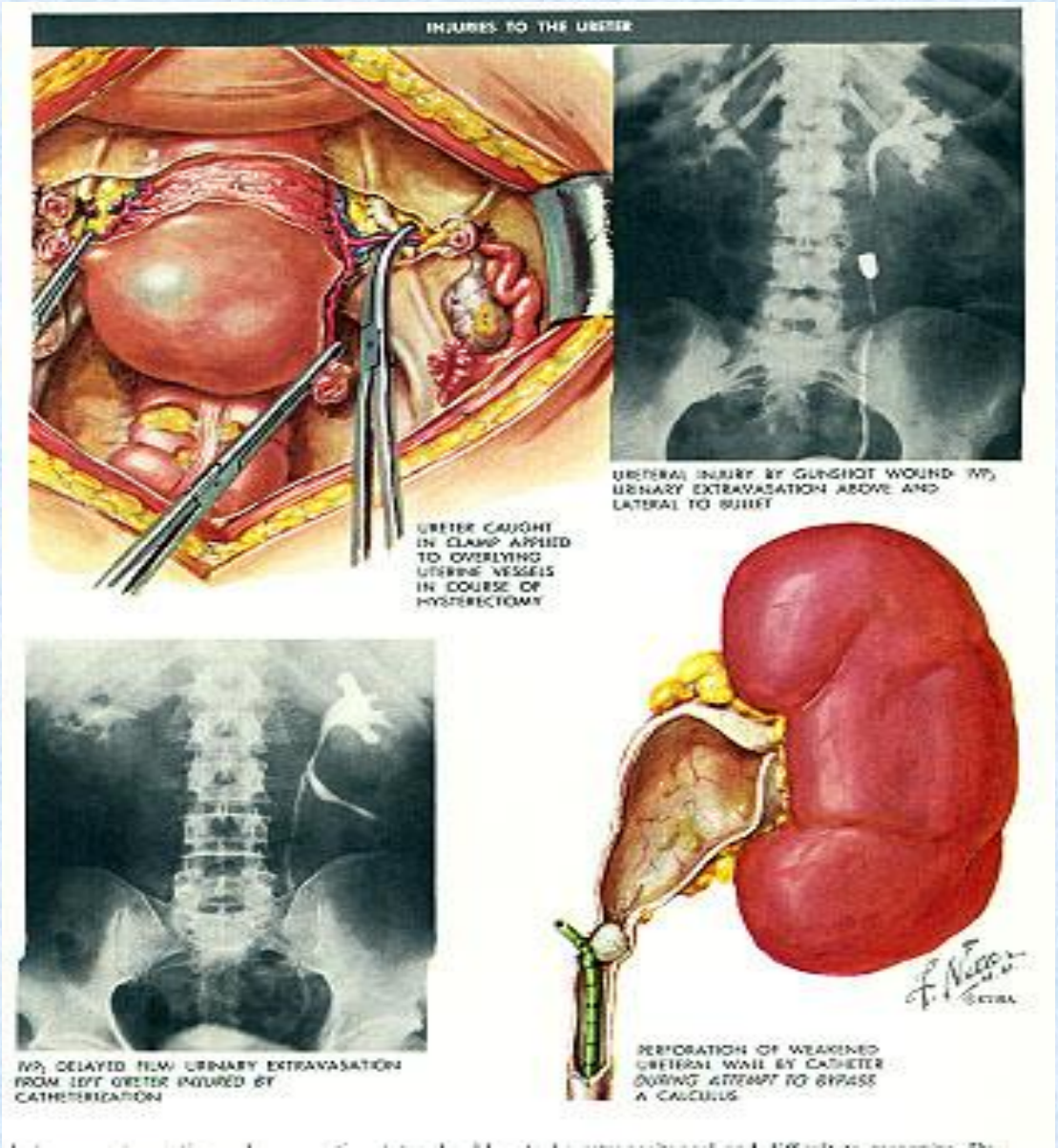
- Thin, mobile tubes running between renal pelvis and posterior superior angle of bladder
- Retroperitoneal in abdomen
- Protected from injury by size and mobility



Ureteral Trauma

- Accounts for 1% of urologic trauma
- Most commonly iatrogenic following GU, gynecologic, vascular or colorectal surgery
- If following external trauma, 80-95% due to penetrating mechanism, usually GSW

Ureteral Trauma



Pathophysiology

- Rare, most due to penetrating injury or iatrogenic
- Most in upper 1/3 of ureter, consider in patient with recent penetrating injury and palpable flank mass
- Blunt injuries often associated with other injuries

Diagnosis/Treatment

- Usually made by finding urine in surgical wounds/dressings or the development of a urinoma
- Contrast CT or bolus IVP will delineate the injury
- Retrograde pyelography will aid in diagnosis
- All injuries need surgical repair

When are you concerned about ureteral injuries?

- Recent GU, gynecologic, vascular or colorectal procedure
- Penetrating (usually GSW) trauma to abd, back, flank
- Deceleration mechanisms
- Suspicion raised with injuries to iliac vessels, urinary bladder, sigmoid colon, thoracolumbar dislocations, lumbar spine (including process) fractures

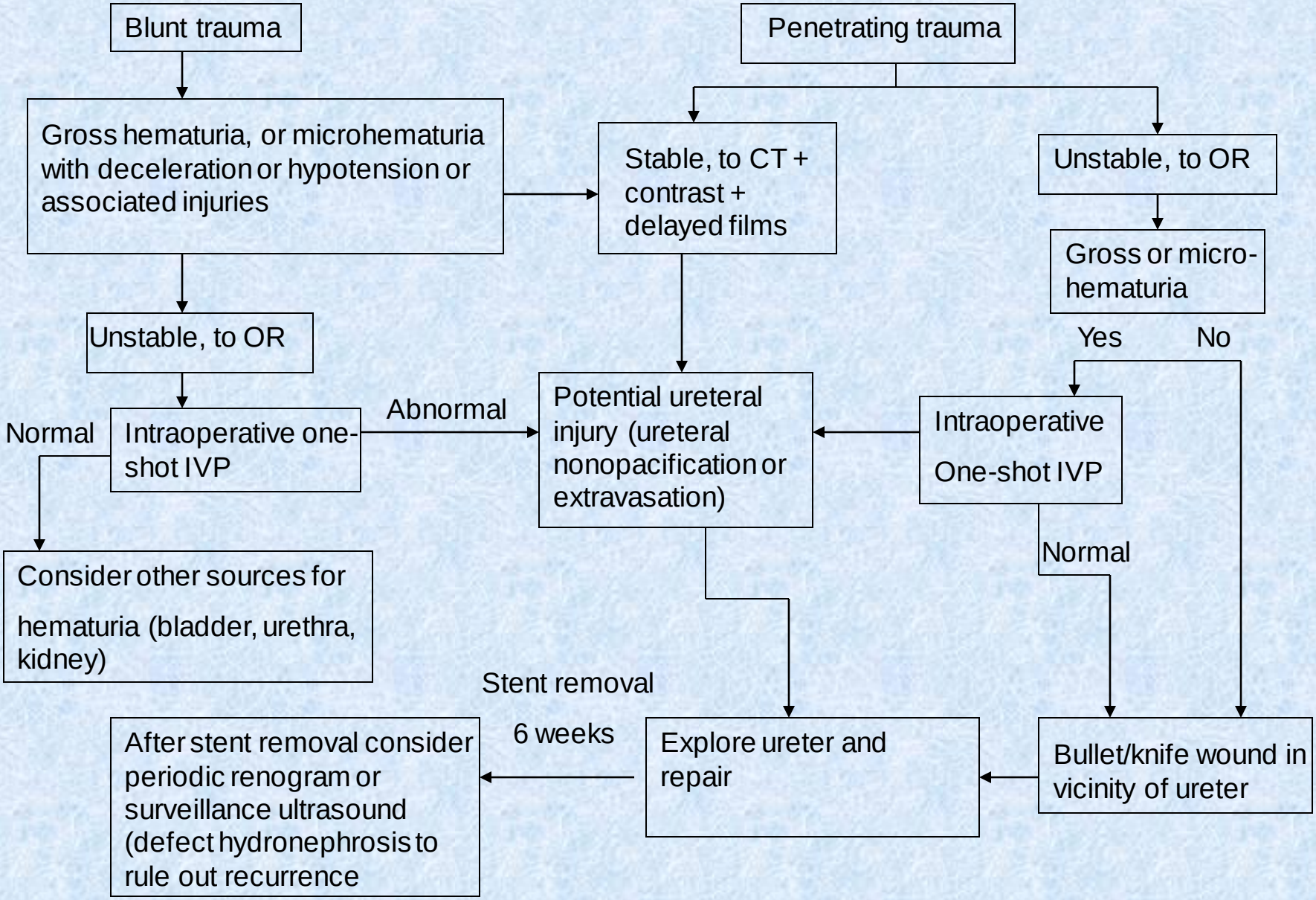
Hematuria following ureteral injuries

- Ureteral injury following iatrogenic cause—10-15% of patients with hematuria
- Hematuria absent in 30-60% of identified ureteral injuries from external violence
- Hematuria following penetrating trauma—a study of 71 ureteral injuries
  - 32% without hematuria
  - 40% with gross hematuria
  - 28% with microscopic hematuria

IMAGING FOR URETERAL INJURIES

- Most injuries diagnosed during laparotomy and no imaging ever done
- Contrast CT with delayed imaging—most common findings are extravasation of contrast into medial perirenal space and absence of contrast in distal ureter if transected
- Retrograde pyelogram
- IVP—one shot IVP done in OR for penetrating trauma

Delayed CT images showing extravasation of urine from ureteral injury


Blunt trauma
Penetrating trauma
Gross hematuria, or microhematuria with deceleration or hypotension or associated injuries
Stable, to CT + contrast + delayed films
Unstable, to OR
Gross or micro-hematuria
Unstable, to OR
Yes
No
Abnormal
Potential ureteral injury (ureteral nonopacification or extravasation)
Intraoperative One-shot IVP
Normal
Intraoperative one-shot IVP
Normal
Consider other sources for hematuria (bladder, urethra, kidney)
Stent removal
6 weeks
After stent removal consider periodic renogram or surveillance ultrasound (defect hydronephrosis to rule out recurrence
Explore ureter and repair
Bullet/knife wound in vicinity of ureter

American Association for the Surgery of Trauma (AAST) Ureter Injury Severity Scale

Grade		Injury Description
I	Hematoma	Contusion or hematoma without devascularization
II	Laceration	≤ 50 % transection
III	Laceration	≥ 50 % transection
IV	Laceration	Complete transection with 2 cm devascularization
V	Laceration	Avulsion of renal hilum which devascularizes kidney

Ureter Trauma Management

- Ureterostomy
- Irrigation and Drainage
- Antibiotics
- Stenting

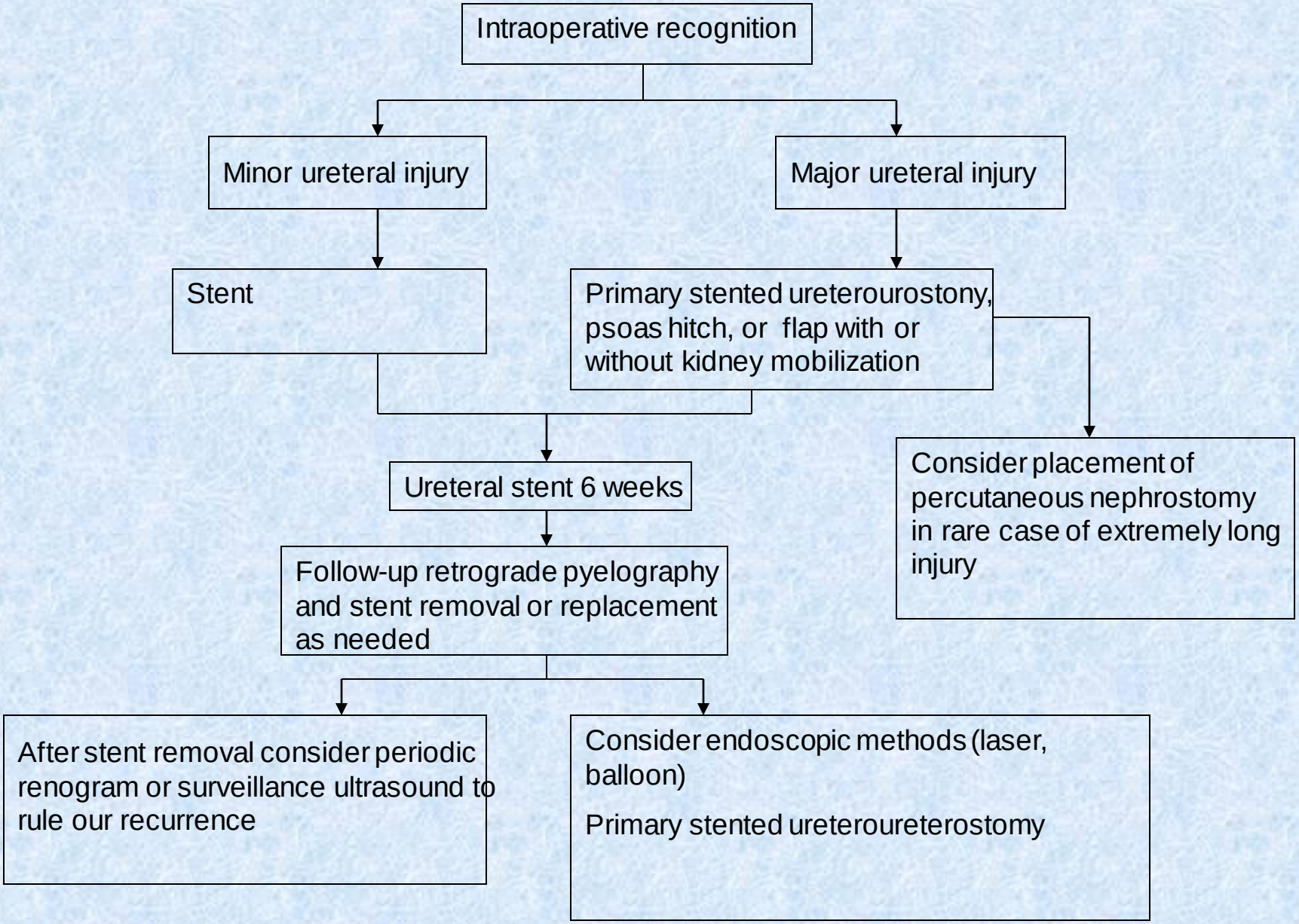
Complications of Ureter Trauma

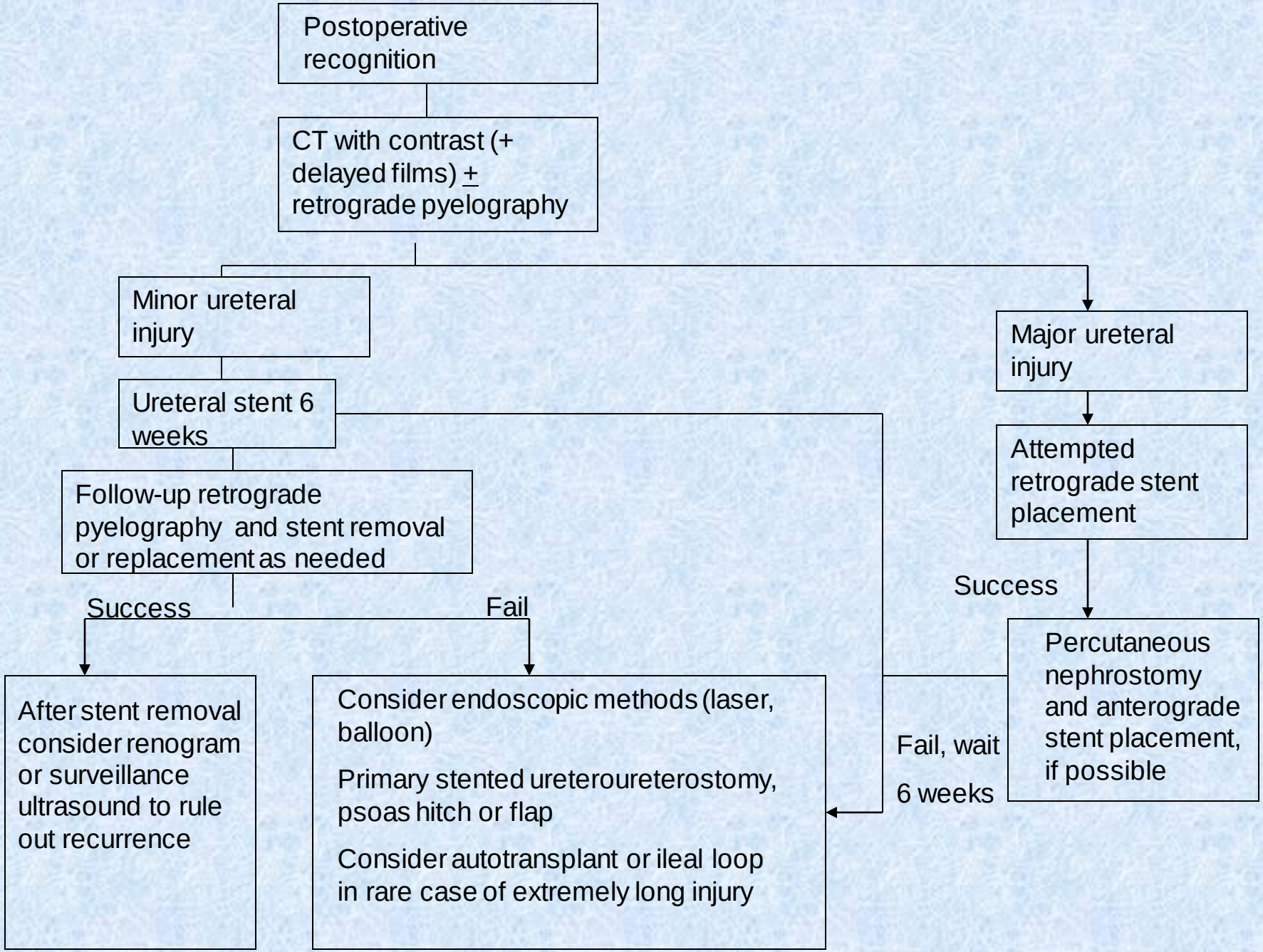
Missed injuries usually manifest by

- 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


Intraoperative recognition
Minor ureteral injury
Major ureteral injury
Stent
Primary stented ureterourostony, psoas hitch, or flap with or without kidney mobilization
Consider placement of percutaneous nephrostomy in rare case of extremely long injury
Ureteral stent 6 weeks
Follow-up retrograde pyelography and stent removal or replacement as needed
After stent removal consider periodic renogram or surveillance ultrasound to rule our recurrence
Consider endoscopic methods (laser, balloon)
Primary stented ureteroureterostomy


Postoperative recognition
CT with contrast (+ delayed films) ± retrograde pyelography
Minor ureteral injury
Major ureteral injury
Ureteral stent 6 weeks
Follow-up retrograde pyelography and stent removal or replacement as needed
Attempted retrograde stent placement
Success
Fail
Success
After stent removal consider renogram or surveillance ultrasound to rule out recurrence
Consider endoscopic methods (laser, balloon)
Primary stented ureteroureterostomy, psoas hitch or flap
Consider autotransplant or ileal loop in rare case of extremely long injury
Fail, wait 6 weeks
Percutaneous nephrostomy and anterograde stent placement, if possible

MANAGEMENT OF URETERAL INJURIES

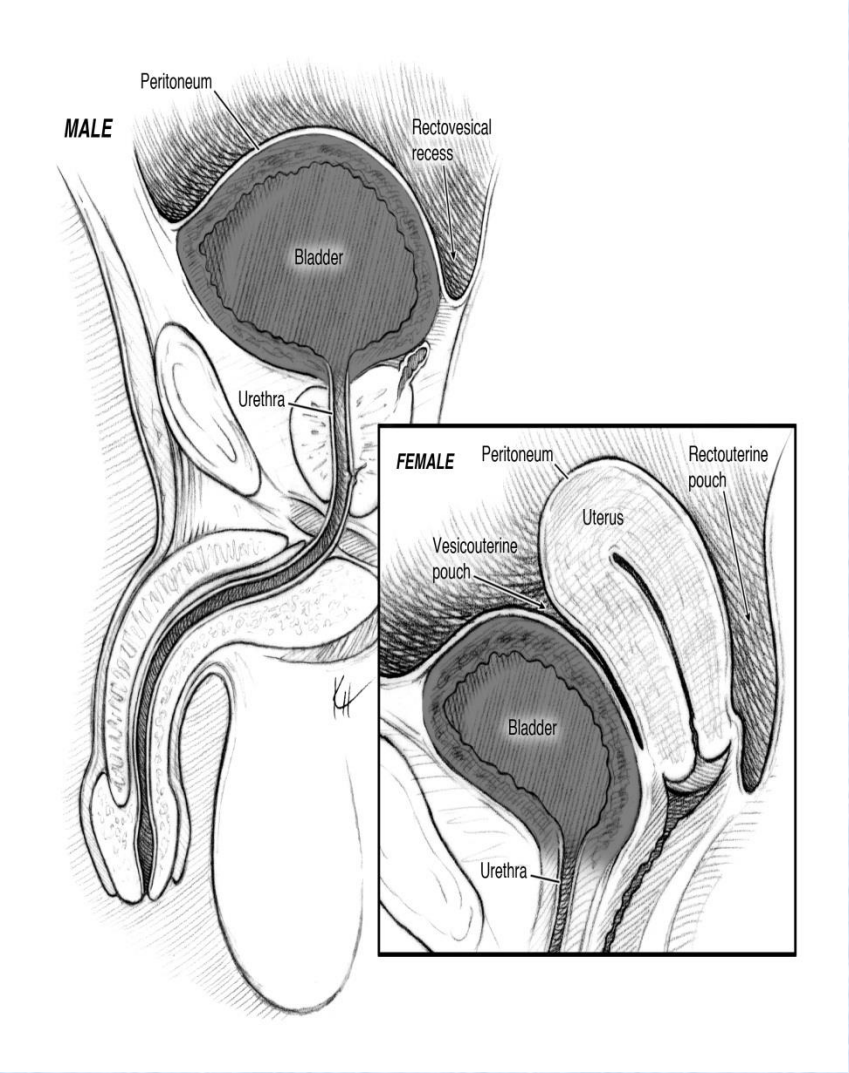
- Treatment
  - Stents—Grade 1
  - Surgery—Grade 2 and above
- Complications
  - Ureteral stricture
  - Fistula
  - Retroperitoneal fibrosis
  - Abscess/Sepsis

Urinary Bladder Trauma

Bladder Anatomy

- Lies within pelvis when empty, can reach umbilicus when full
- Consists of 3 muscle layers
- Blood supplied from int. iliac artery, nerve supply from lumbar and sacral plexus
- Bladder trauma usually associated with severe injuries, mortality 22-44%

Urinary Bladder Anatomy



- Empty bladder is a pelvic organ and protected by pelvic bones
- With distention, becomes an abdominal organ and more prone to injury due to direct trauma
- Peritoneum covers superior surface of bladder

Pathophysiology

- Intraperitoneal rupture usually from blunt trauma in patients with a full bladder
- Clinically will see lower abdominal pain, inability to urinate, blood at meatus

Pathophysiology

- Can rupture in or outside of peritoneum, or both
- Extraperitoneal rupture usually from pelvic fracture with laceration of bladder, but may occur with blunt trauma

Urinary Bladder Trauma

- Mechanisms of Injury
  - Blunt—up to 85% of cases
    - 70-95% of patients with bladder injuries will have pelvic fractures
    - 6-10% of patients with pelvic fractures will have bladder injuries
  - Penetrating—up to 15% of cases
  - Surgical/Cystoscopy

When are you concerned about a bladder injury?

- Clinical Presentation
  - Suprapubic pain
  - Difficulty voiding
- Gross Hematuria—incidence approaches 100%
- Microscopic Hematuria possible with penetrating trauma, spontaneous bladder rupture
- X-ray
  - Widened symphysis pubis is stongest predictor
  - Pelvic, sacrum, iliac, ramus fractures
  - Widening of SI joint

Lab

- Gross hematuria indicative of urologic injury
- Clear urine and no pelvic fracture virtually eliminates possibility of bladder rupture
- 98% of patients with bladder rupture have gross hematuria

Diagnostic Studies

- Retrograde cystogram
- Retrograde CT cystogram

- Either one follows urethogram if concern for urethral injury exists

Indications for Cystography

- Blunt Trauma in close proximity to bladder with gross hematuria
- Pelvic fractures from blunt mechanism with any degree of hematuria
- Penetrating Trauma in proximity to the bladder
- Penetrating trauma with any degree of hematuria

Retrograde Cystogram

- Exclude urethral injury and place a Foley
- Contrast is instilled under gravity thru a Toomey syringe without its central piston
- Obtain KUB first
- Instill contrast until 100cc with x-ray evidence of extravasation, 300-400 cc in patient older than 11
- Use flouroscopic monitoring
- Children (age+2)x30cc

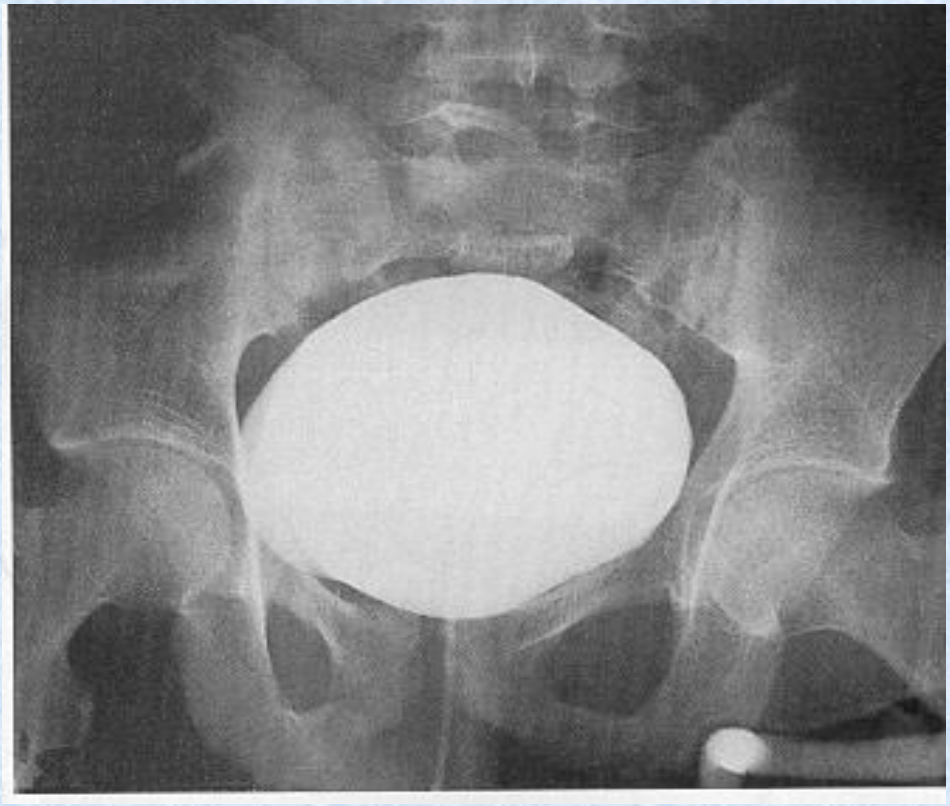
Retrograde Cystogram

- Foley is clamped and AP film taken
- Then empty bladder and take post-evacuation film
- If extraperitoneal perforation, will see contrast in area of pubic symphysis,intraperitoneal perforation will outline abdominal contents
- May see false negatives if less than 300-400cc of contrast used

CT SCAN

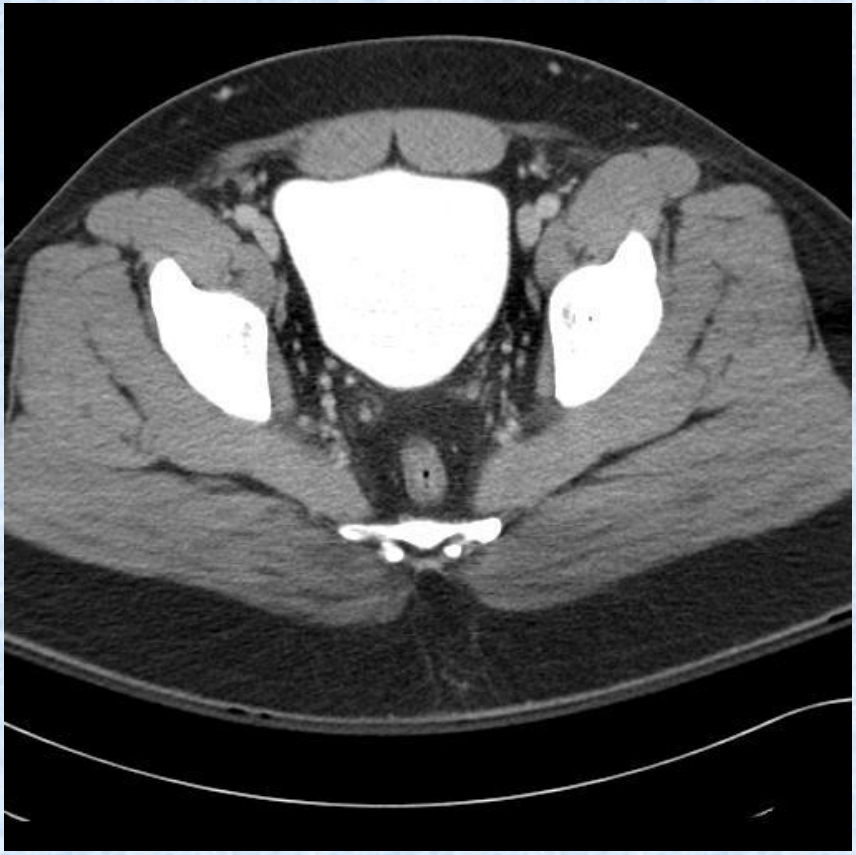
- Obtain same anatomic info, contrast instilled in retrograde fashion

Retrograde Cystogram--Normal



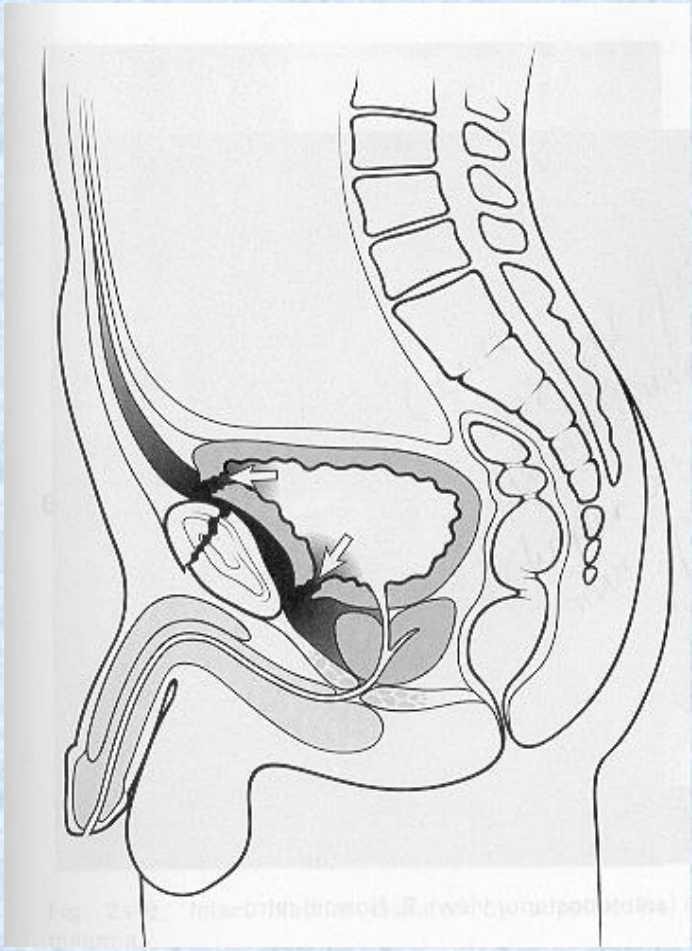
Retrograde Cystogram—Post-Void, Normal

CT Cystogram



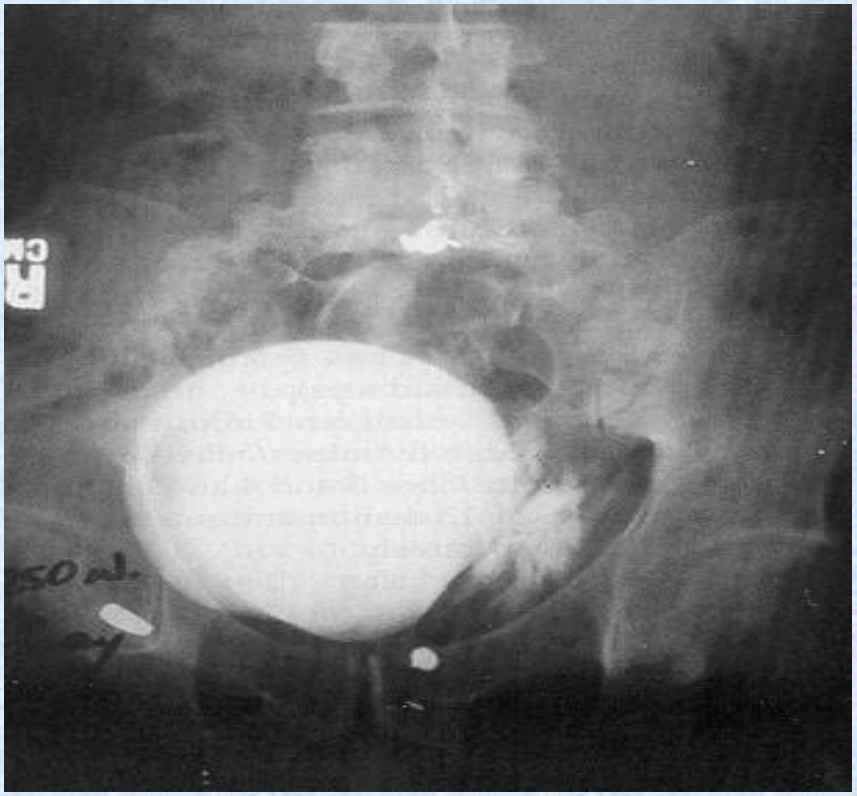
- Same technique as for plain cystogram, no need to do post void study
- Sensitivity also approaches 100%

Extraperitoneal Bladder Rupture

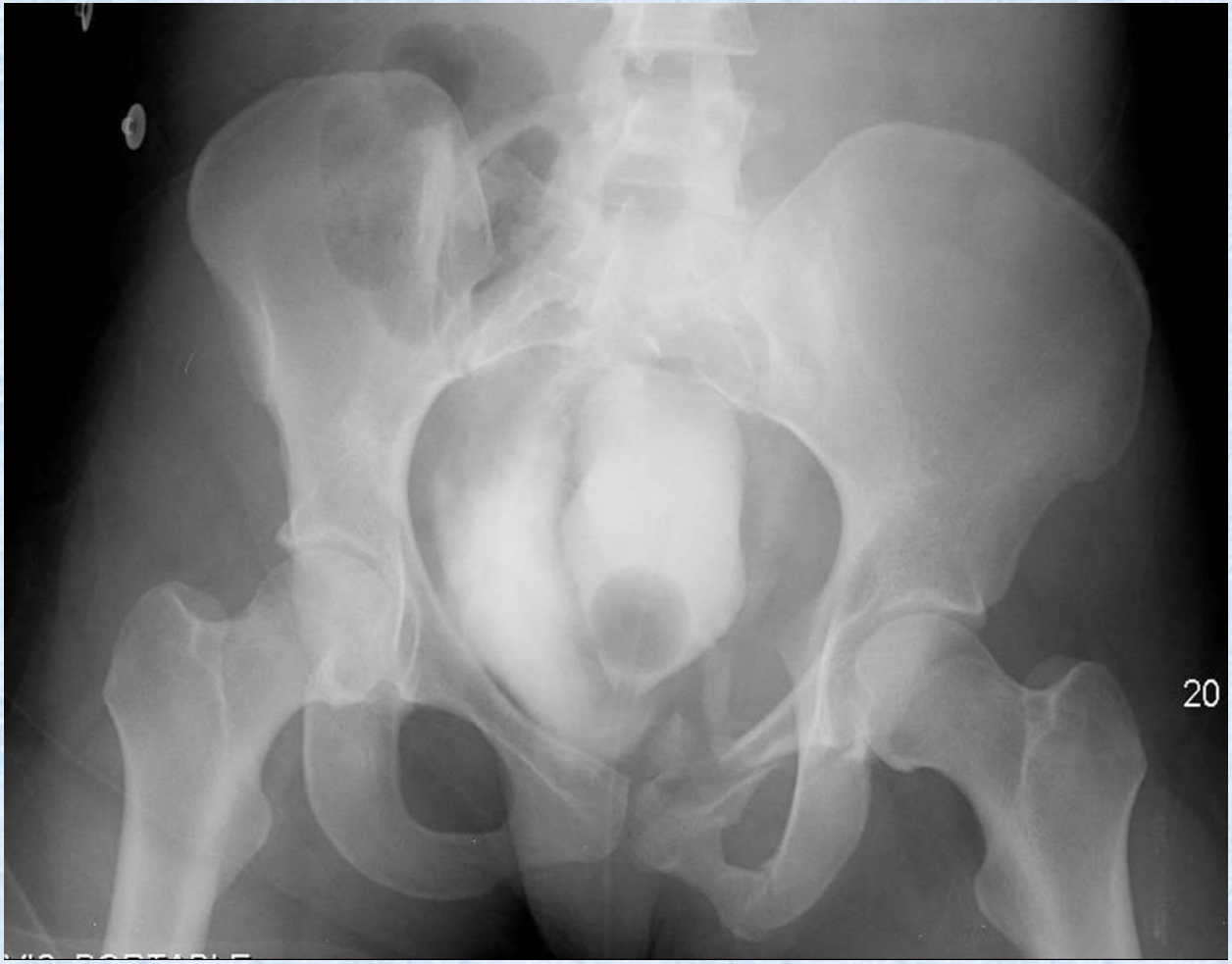


- 50-90% of bladder ruptures
- Usually associated with pelvic fracture
- Usually treated with urethral/suprapubic catheter

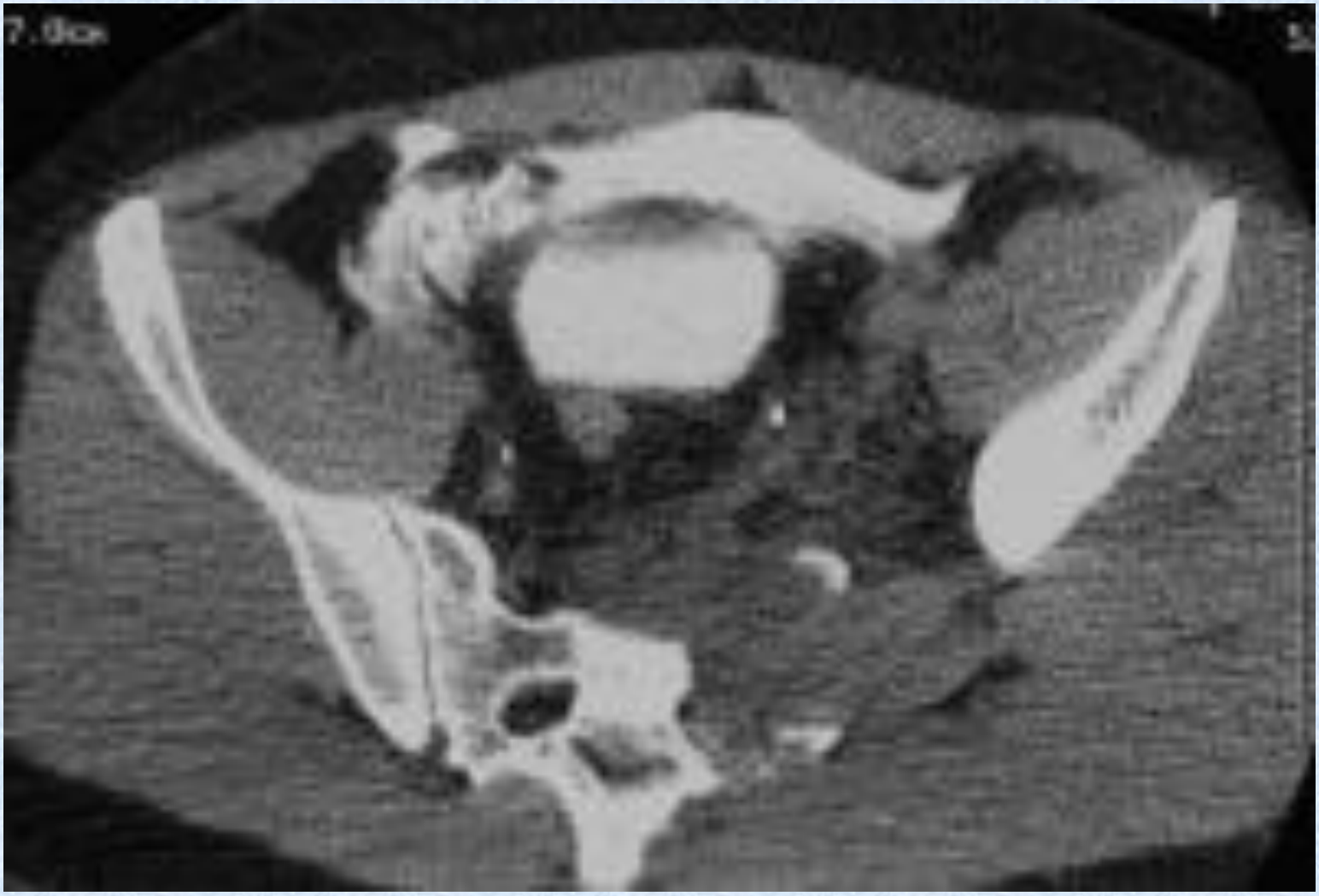
Retrograde Cystogram—Extraperitoneal Rupture



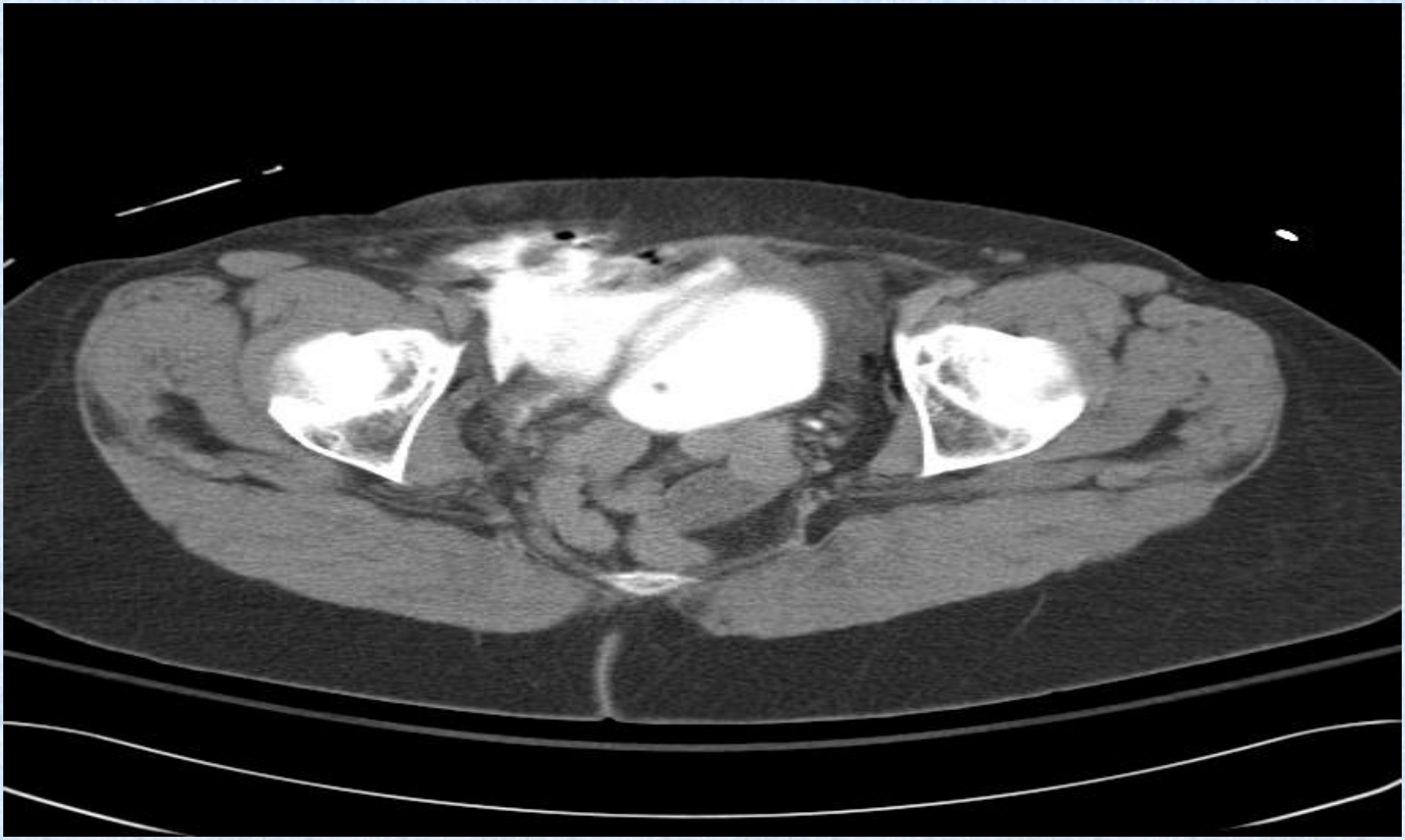
Retrograde Cystogram—Extraperitoneal Rupture



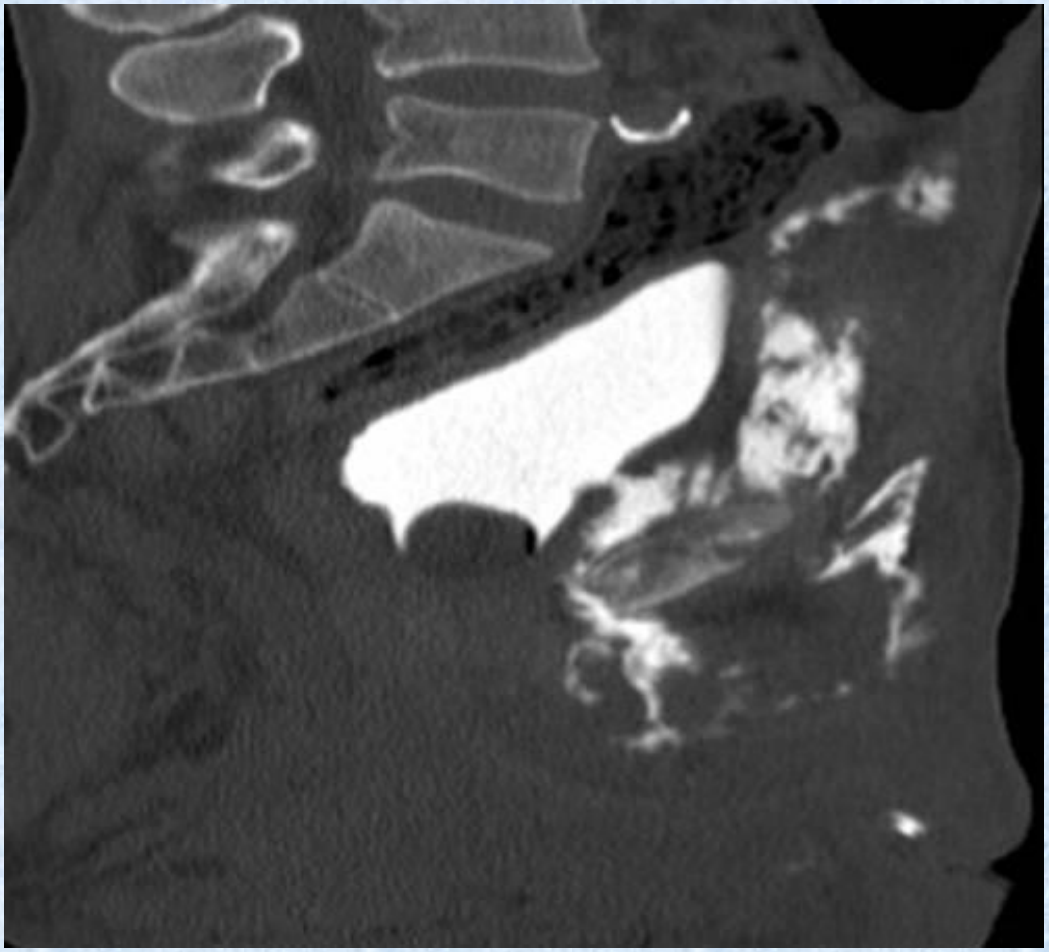
CT Cystogram—Extraperitoneal Rupture



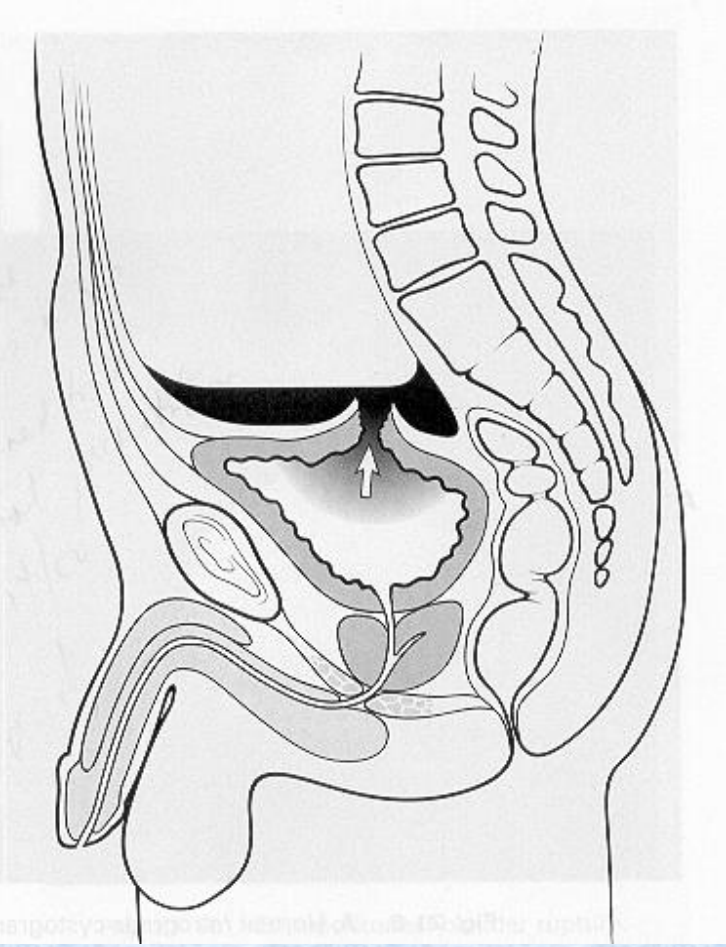
CT Cystogram with Extraperitoneal Rupture



CT Cystogram with Extraperitoneal Rupture with Sagittal View



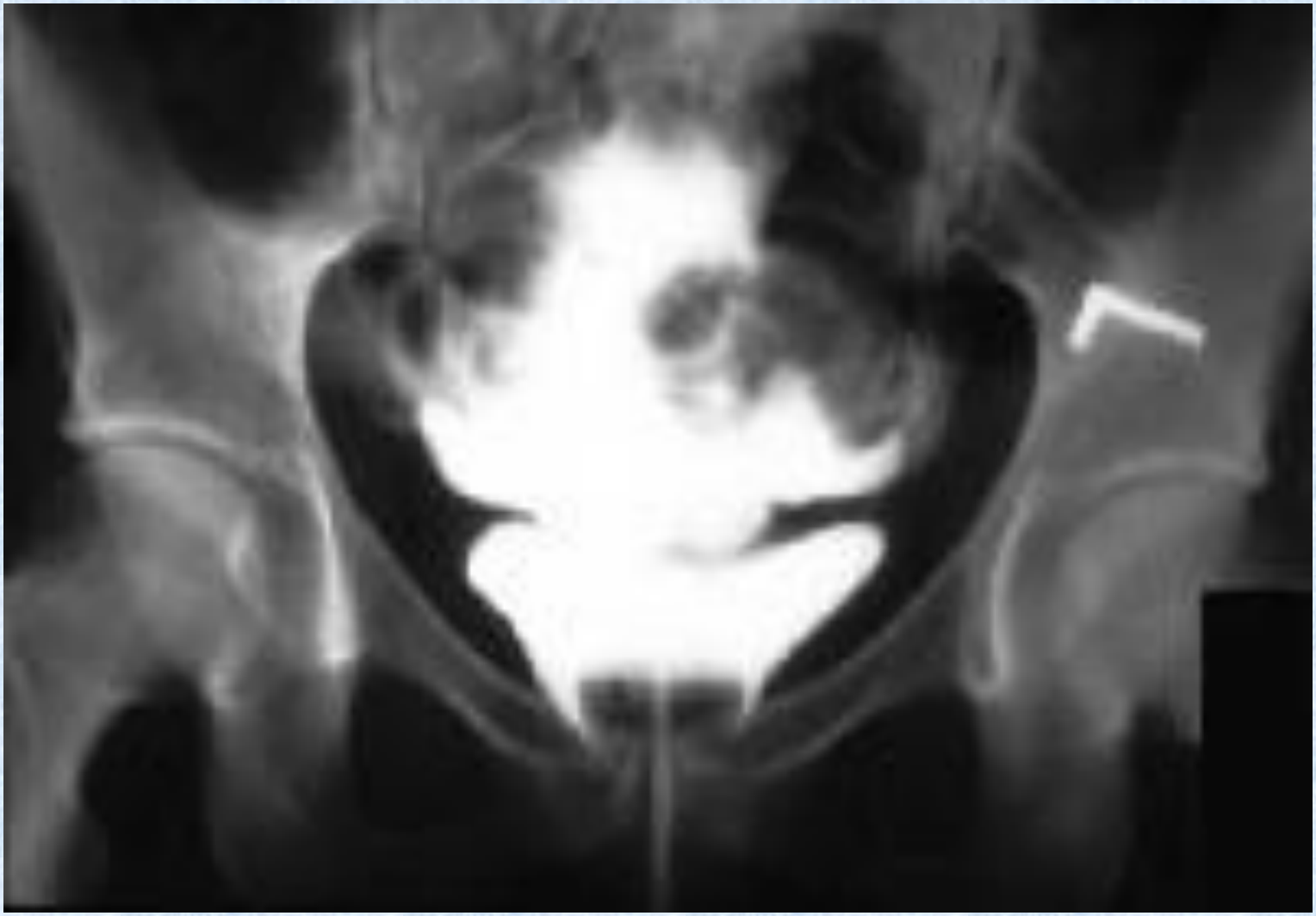
Intraperitoneal Bladder Rupture



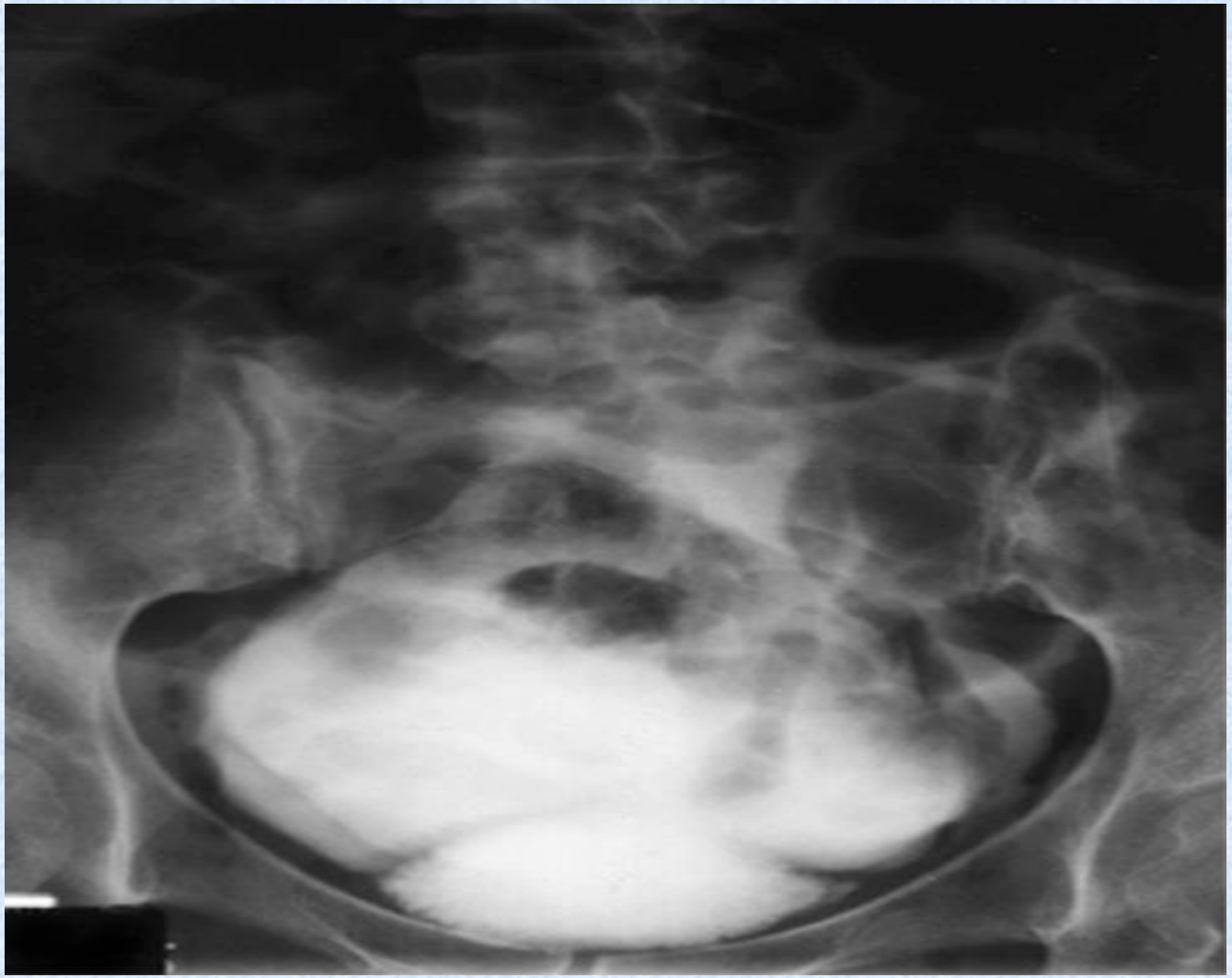
- 15-35% of bladder ruptures
- Bladder usually distended at time of trauma
- Historically treated surgically
- Conservative management possible

Retrograde Cystogram—Intraperitoneal Rupture

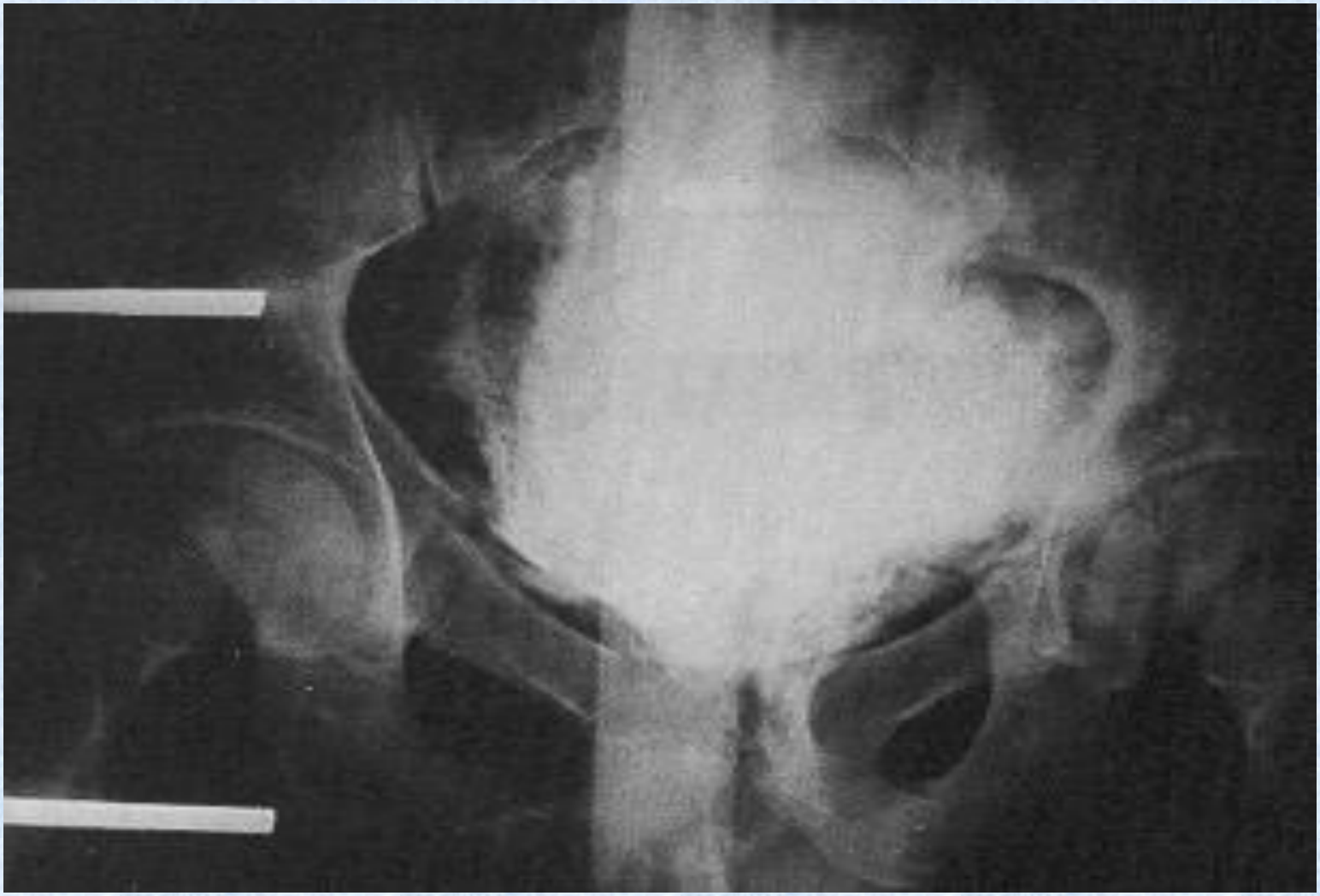
Retrograde Cystogram—Intraperitoneal Rupture



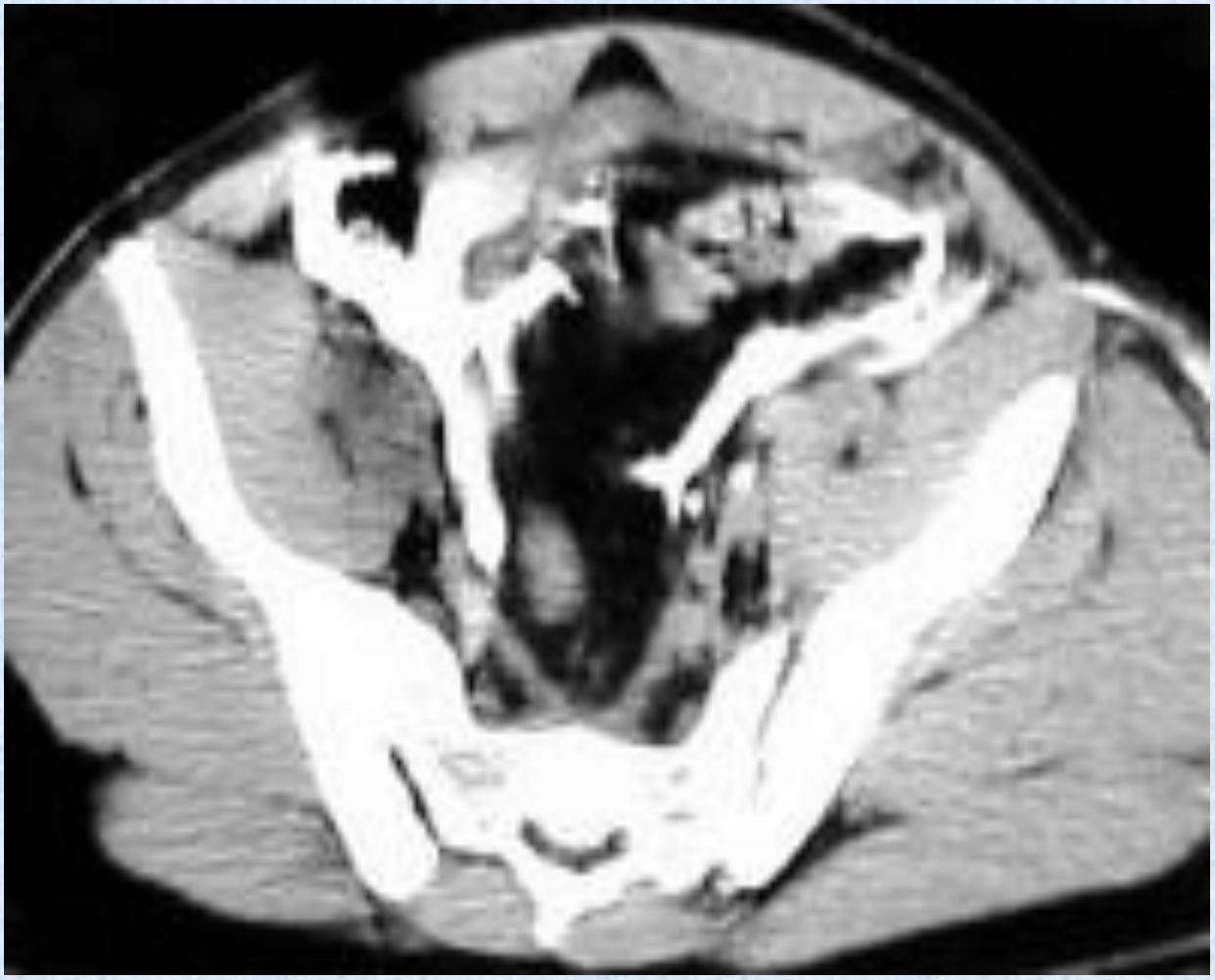
Retrograde Cystogram—Intraperitoneal Rupture



Retrograde Cystogram—Intraperitoneal Rupture



CT Cystogram-Intraperitoneal Rupture



CT Cystogram—Intraperitoneal Rupture

Bladder Injury Scale

Grade		Injury Description
I	Hematoma	Contusion, intramural hematoma
	Laceration	Partial thickness
II	Laceration	Extraperitoneal bladder wall laceration ≤ 2 cm
III	Laceration	Extraperitoneal (≥ 2 cm) or intraperitoneal (≤ 2 cm) bladder wall lacerations
IV	Laceration	Intraperitoneal (≥ 2 cm) bladder wall lacerations
V	Laceration	Intra or extraperitoneal bladder wall laceration extending into the bladder neck or urethral orifice (trigone)

Treatment

- If no extravasation treat with or without Foley drainage
- Extraperitoneal ruptures treated with Foley drainage for 7 to 15 days with 20Fr. or greater sized catheter

Treatment

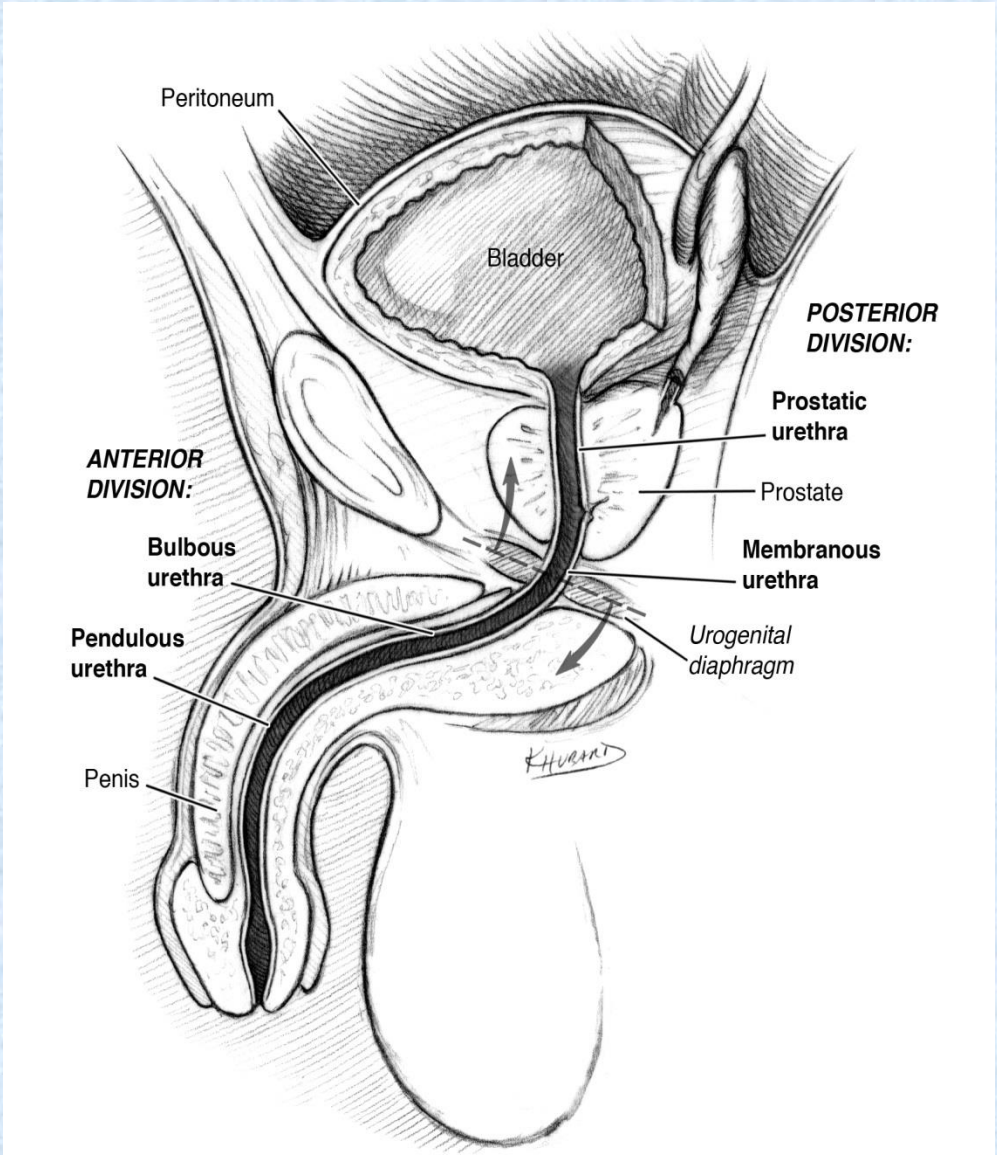
- Surgical repair if rupture involves bladder neck or proximal urethra
- Intraperitoneal ruptures always require surgical repair
  - Children 77%
  - Increased Bun/Cr
  - Potentially lethal

Complications of Bladder Trauma

- Mortality associated with bladder injury is reported to be 11-44%. Higher mortality associated with intraperitoneal rupture.
- Death from a bladder injury is usually attributed to hemorrhage, sepsis or anorectal injury.

Urethral Injuries

Urethral Anatomy



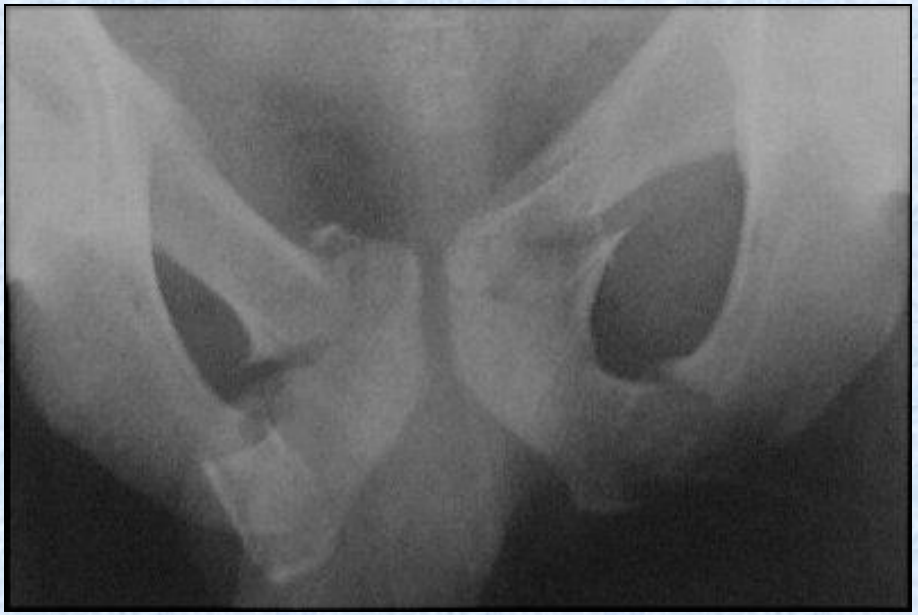
- Anatomy based on relation to urogenital diaphragm
  - Posterior
    - Prostatic
    - Membranous
  - Anterior
    - Bulbous
    - Penile

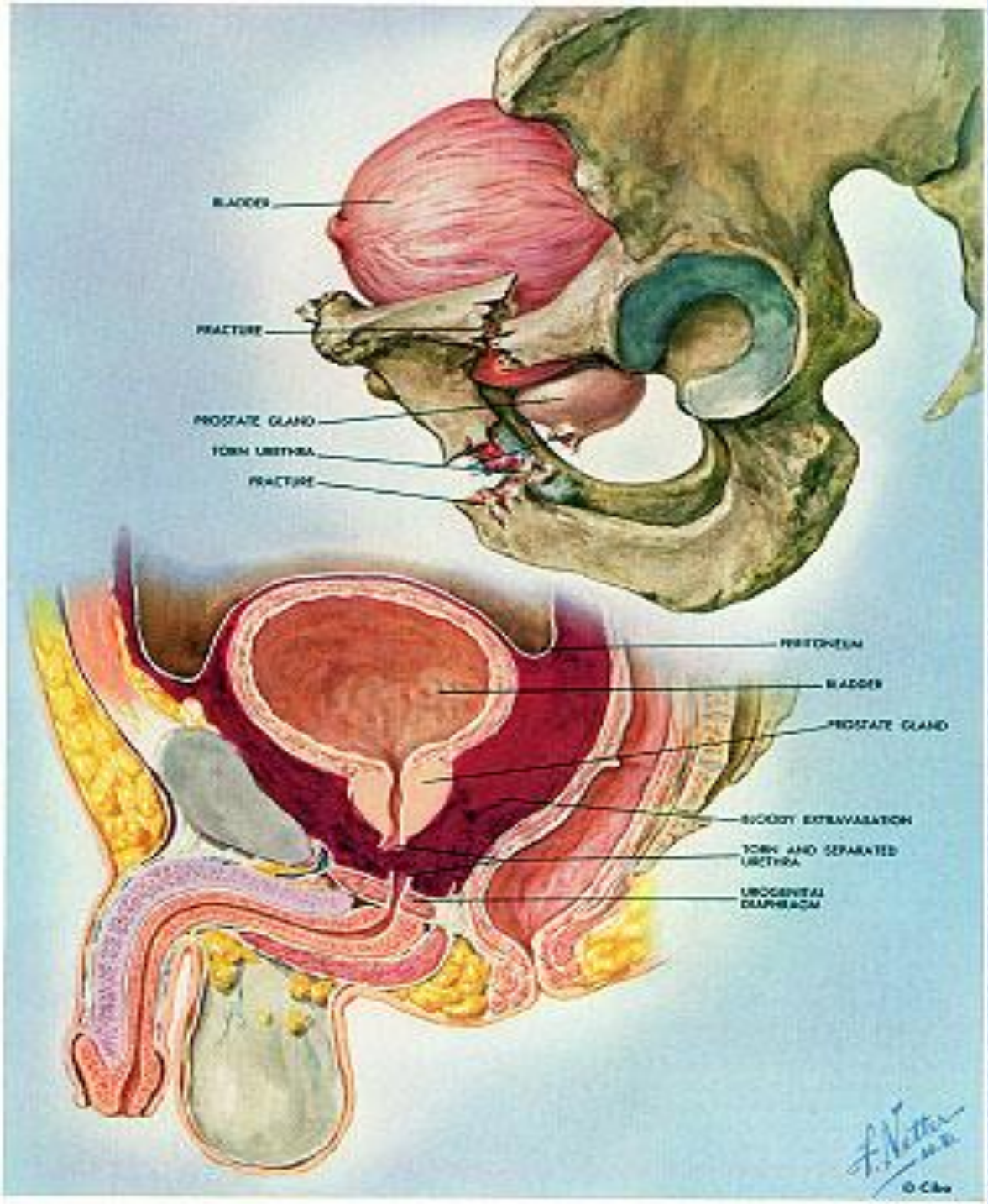
Urethral Injuries

- 10% of all injuries to GU system
- Potentially most debilitating GU injury due to complications
- Rare in women
- Mechanism of Injury
  - Blunt trauma such as mvc, bike accidents, straddle mechanisms
  - Often associated with pelvic fractures
  - Rarely penetrating trauma
  - Occasionally iatrogenic

Urethral Trauma Mechanism of Injury

- Posterior injury usually accompanies pelvic fractures
- Trauma to anterior urethra usually isolated
- Trauma to posterior urethra usually co-exists with damage to other structures
- Sudden deceleration injuries (bladder shears off urethra)




BLADDER
FRACTURE
PROSTATE GLAND
TORN URETHRA
FRACTURE
PERITONEUM
BLADDER
PROSTATE GLAND
BLOODY EXTRAVASATION
TORN AND SEPARATED URETHRA
UROGENITAL DIAPHRAGM

Signs and Symptoms of Urethral Trauma

- Suprapubic pain
- Urge to urinate but are unable to
- Hematuria (may be microscopic)
- Blood at external meatus
- Perineal bruising – aka butterfly pattern bruise

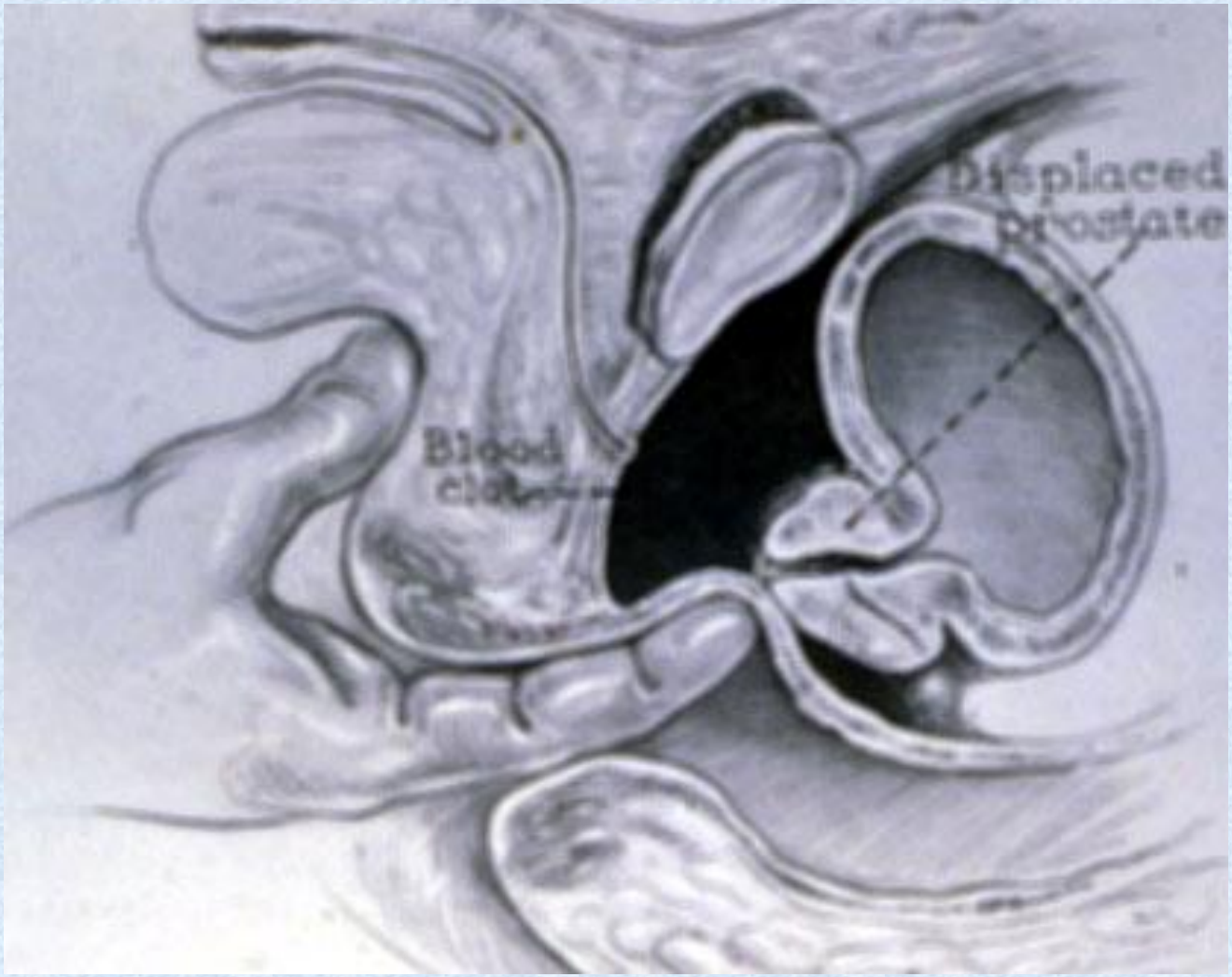
- Scrotal Hematoma
- Rebound tenderness upon palpation
- Abdominal wall muscle rigidity, spasm or involuntary guarding
- Displaced/boggy prostate gland (in males) during rectal exam

Physical Exam

- Careful exam of abdomen/torso and compression of pelvic girdle/pubic symphysis
- Examine genitalia, looking for hematoma or blood at urethral meatus
- Do not insert foley if blood at meatus until retrograde urethrogram done

Physical Exam

- Women with pelvic fractures need to have a vaginal exam as bone fragments may lacerate the vaginal vault
- OK to pass a Foley in females with pelvic fractures
- Rectal exam to check for “high riding” prostate


Displaced
Prostate
Blood

Clinical Features

- Lack of pelvic tenderness, no hematomas, normal rectal exam all support an intact urethra
- Pelvic crush injury
- Blood at meatus
- Distended Bladder
- Catheter-no urine output

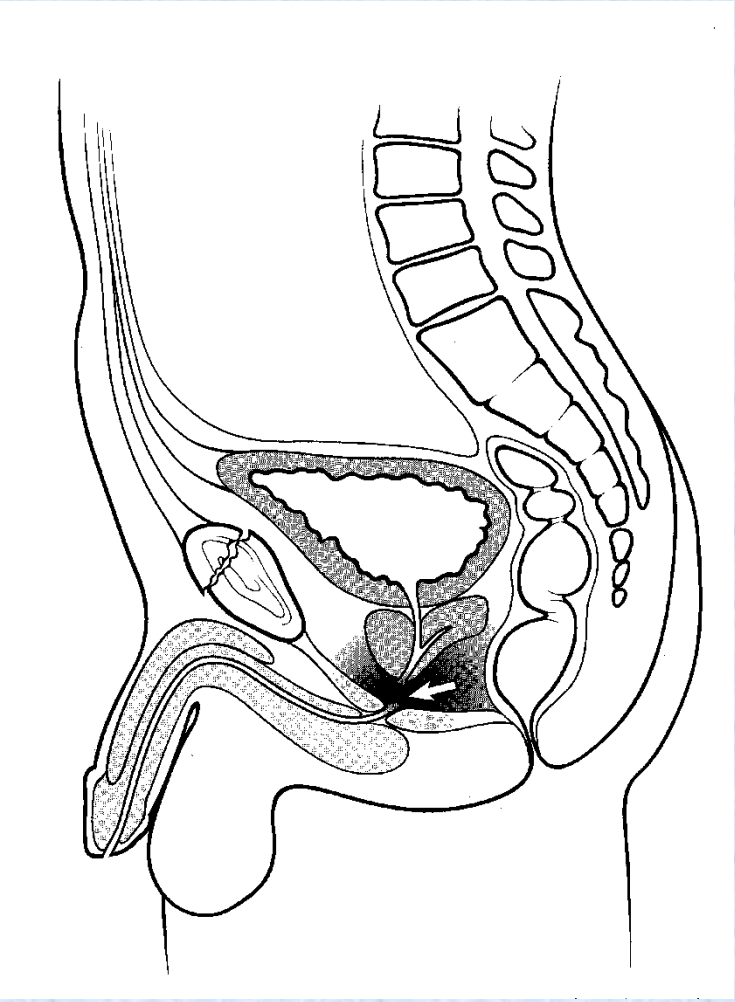
Diagnosis

- Ability to pass a Foley precludes complete urethral disruption, partial tear may exist
- If partial tear exists/attempt of passage of a Foley may be done, consult urology if difficulty
- Consider urethral tear in any patient following unsuccessful cath followed by bleeding

Physical Assessment

- **Perineal area**
  - Bleeding from urinary meatus
  - Butterfly pattern ecchymosis
  - Scrotal edema

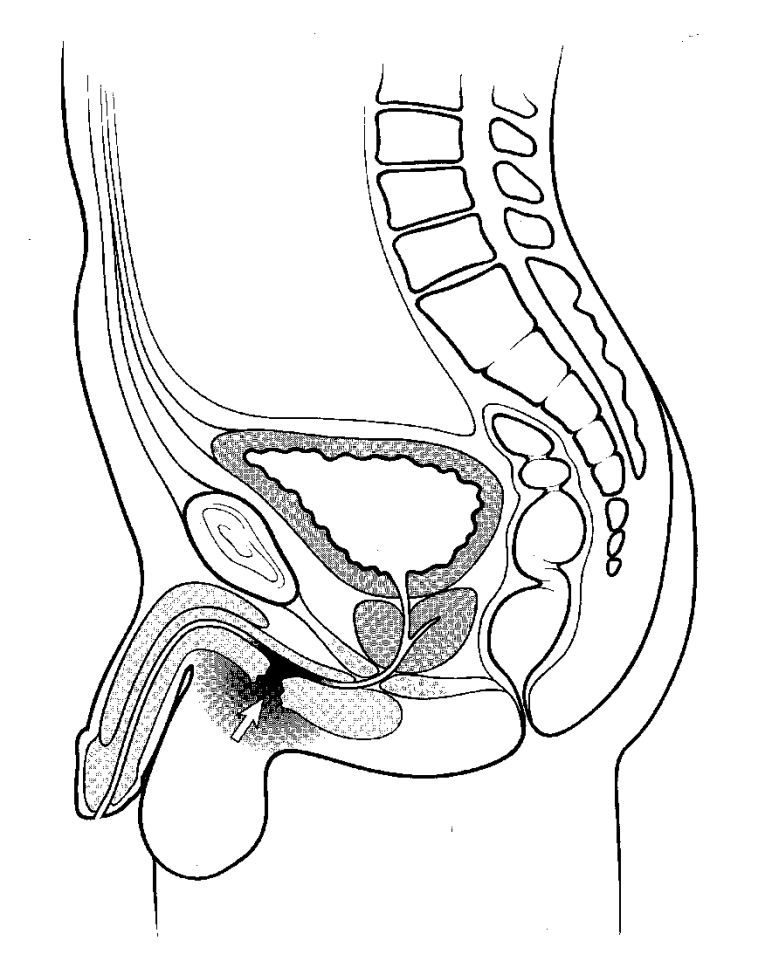
Posterior Urethral Injuries



- 80-90% occur in combination with pelvic fracture
- 10-25% of pelvic ring fractures disrupt posterior urethra as puboprostatic ligaments are torn or stretched
- Associated with bladder injuries and vaginal lacerations

Anterior Urethral Disruption

- Usually due to direct blunt force trauma such as saddle injury
- Does not cause high riding prostate as injury is below the urogenital diaphragm
- Ureteral injury present in 10-38% of penile fractures (rupture of one or both tunica albuginea, fibrous covering of corpus cavernosa)



Urethral Injury Scale

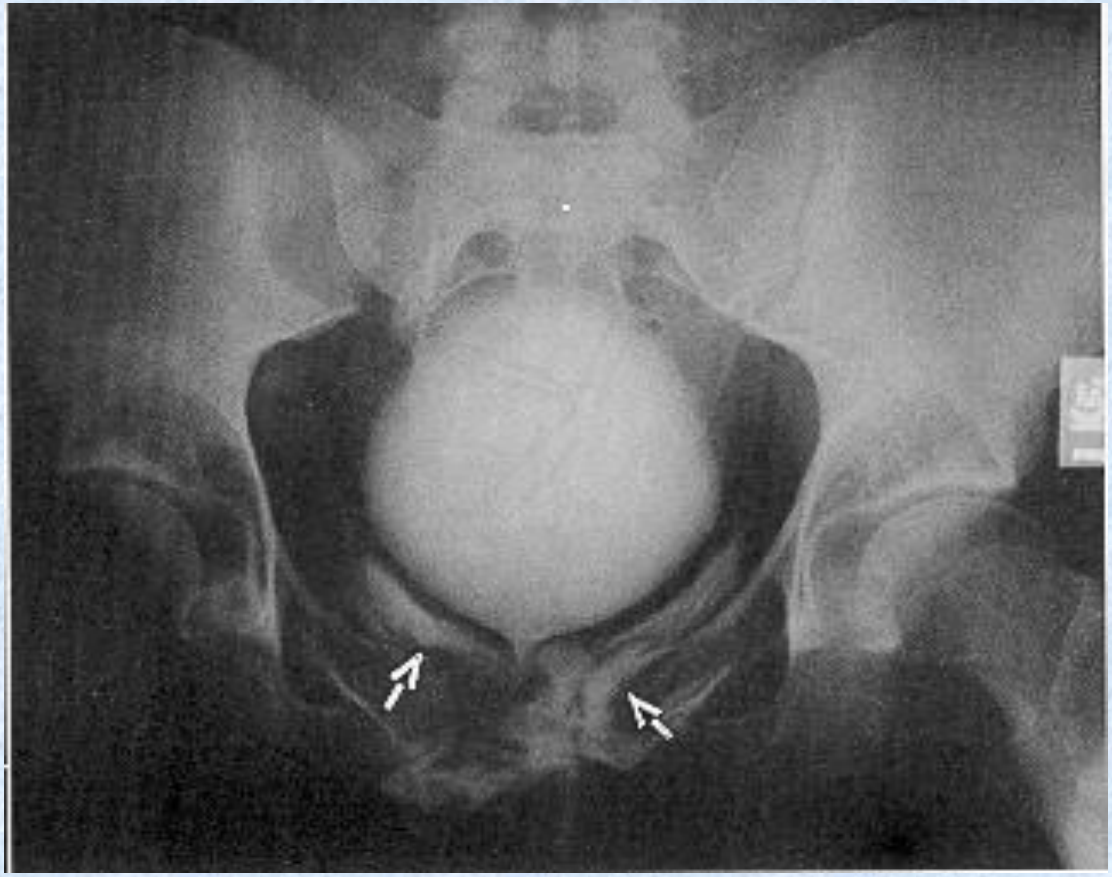
Grade		Injury Description
I	Contusion	Blood at urinary meatus, urethrography normal
II	Stretch Injury	Elongation of urethra without extravasation on urethrography
III	Partial Disruption	Extravasation of urethrographic contrast medium at injury site, with contrast visualized in the bladder
IV	Complete Disruption	Extravasation of urethrographic contrast medium at injury site without visualization in the bladder, < 2 cm of urethral separation
V	Complete Disruption	Complete transection with > 2 cm urethral separation or extension into the prostrate or vagina

Retrograde Urethrogram

- If urethral injury suspected, you may try one gentle attempt at passing urinary catheter—if it does not pass easily, don't push
- Perform urethrogram—instill 10-30 cc of contrast retrograde through urethra
- Complete disruption—contrast extravasates and none reaches bladder
- Partial disruption—contrast extravasates and some reaches bladder

Normal Urethrogram

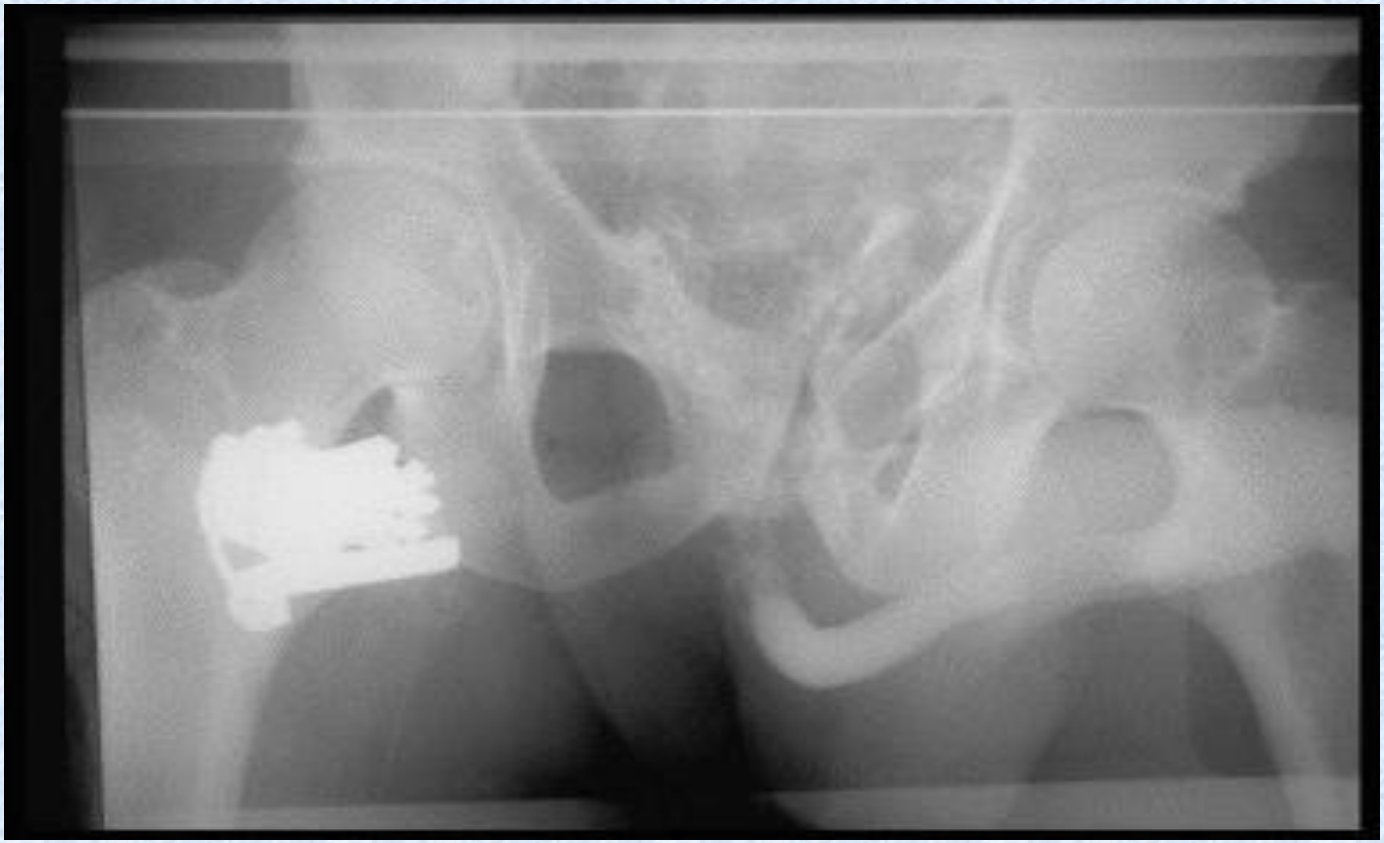
Grade III-Partial Urethral Disruption



Grade III Partial Urethral Disruption

Grade IV or V Complete Urethral Disruption

Grade V Complete Urethral Disruption



Urethral Trauma

Missed injuries usually manifest by

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

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

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 anastamosis 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

Urethral Trauma Female

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

- Delay in diagnosis may result in:
  - Incontinence - Necrotizing fasciitis, sepsis
  - Uretero-vaginal fistula
  - Dyspareunia, recurrent urethritis
  - Hematuria, cystitis

Perineum Injuries: Female Genitalia

- Usually well protected by location deep 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)

Perineum Injuries: Female Genitalia

Perineum/ Sexual assault

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

Foley Catheter

- Foley should be placed in all major trauma patients
- Any urine that is not clear or yellow is considered gross hematuria
- Most lower tract injuries accompanied by pelvic fracture will have blood at meatus or gross hematuria
- Blunt trauma to renovascular pedicle or penetrating uretral injury may not produce hematuria

Treatment

- If normal urethrogram, place a Foley
- For a partial tear, 1 attempt at Foley placement may be done
- For complete tear consult urology, may need to place suprapubic catheter, or attempt endoscopic assisted cath

Urethral Trauma Complications

- Impotence
  - 13-30% of patients with pelvic fracture and urethral distraction injury
- Incontinence
  - Most with significant urethral distraction injury have injury to the external (striated) sphincter, continence is then provided by the bladder neck.
- Stricture

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