Urological Trauma

Urology

Trauma:

1. Given a patient with a potential urinary tract injury:
    1. To list and interpret key clinical findings
    2. To list and interpret critical investigations
    3. Construct an initial management plan
    4. To list and specify previous genitourinary anomaly.

Systems:

- Renal
- Bladder
- Urethra
- Ureter
- External Genitalia

Renal Trauma Overview

- Most commonly injured GU organ
- 10% of all serious injuries abdominal have associated renal injury
- Mode of injury
  - Blunt renal truma
    - MVA, fall from height, assaults
  - Penetrating renal injuries
    - Gunshots and stab wounds.

Hematuria and Renal Injury

- Best indicator of significant injury(microscopic or gross)
- NOT related to the degree of injury
- Gross Hematuria is Variable and absent in :
  - 7 % of grade IV renal injury
  - 36% of renal vascular injury
  - 50% of UPJ injuries

Whom to work up

- Penetrating trauma: EVERYONE
- Pediatric patients with microscopic hematuria.
- Blunt trauma: Image with CT if:
  - gross hematuria
  - microhematuria plus shock
  - microhematuria plus acceleration/deceleration

Mee et al. (1989)
Hardeman et al (1987

Imaging of trauma patient with hematuria

- CT preferred
  - With contrast
  - With “delayed” films (mandatory)
  - Why not get CT cystogram too?
- Standard intravenous pyelogram (IVP): Forget it
- “One Shot” intraoperative IVP
  - 2 cc/kg intravenous contrast
  - Single film at 10 minutes

Intraoperative One Shot IVP

- Allows safe avoidance of renal exploration in 32%
  (Morey et al, 1999)
- Highly specific for urinary extravasation
- Confirms existence of the other kidney

Fig. 15.4.8. One-shot IVP revealing a nonfunctioning right kidney

AAST Organ Injury Severity Scale for the Kidney

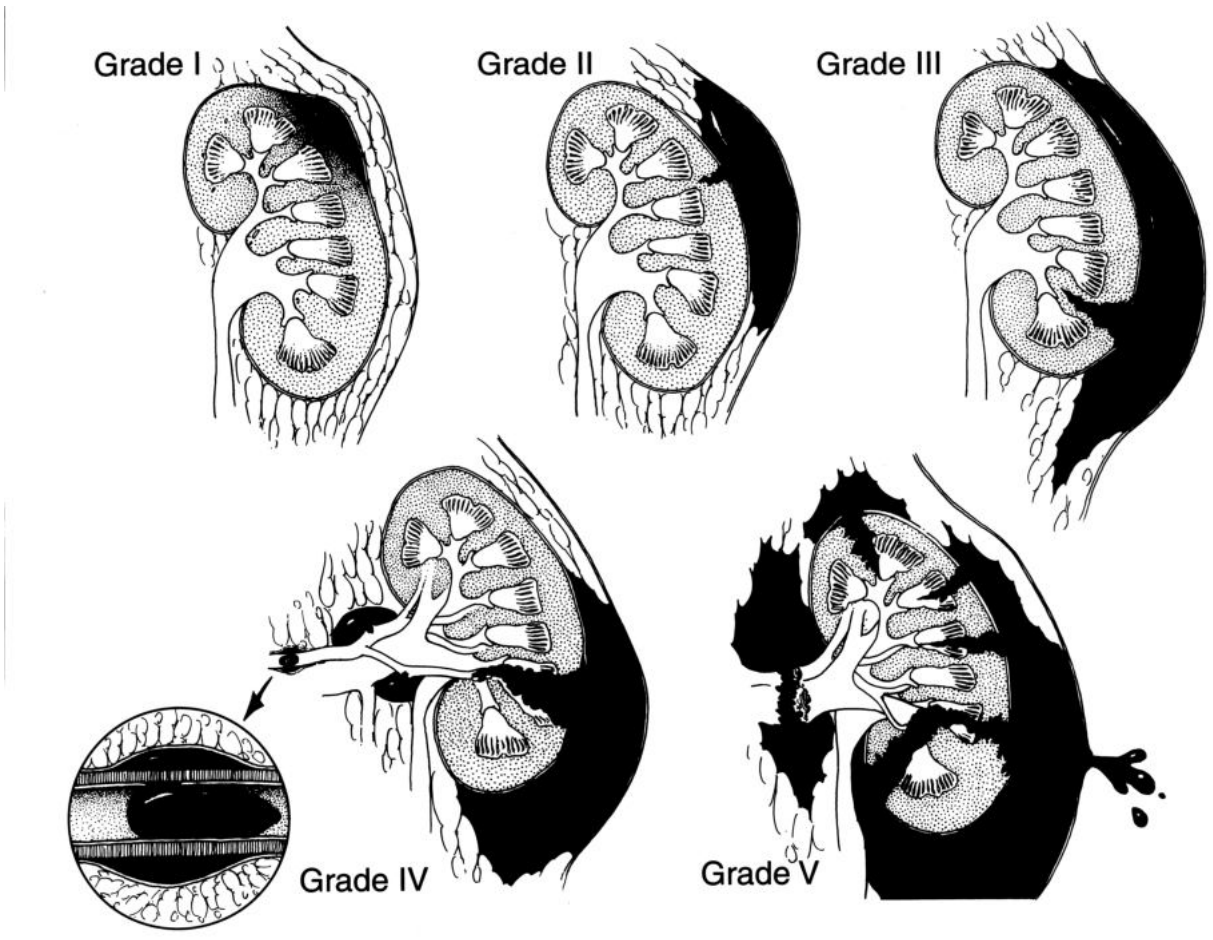
Table 19

Kidney injury scale

Grade*	Type of injury	Description of injury	ICD-9	AIS-90
I	Contusion	Microscopic or gross hematuria, urologic studies normal	866.01	2
	Hematoma	Subcapsular, nonexpanding without parenchymal laceration	866.11	2
II	Hematoma	Nonexpanding perirenal hematma confirmed to renal retroperitoneum	866.01 866.11	2
	Laceration	<1.0 cm parenchymal depth of renal cortex without urinary extravagation	866.02 866.12	2
III	Laceration	<1.0 cm parenchymal depth of renal cortex without collecting system rupture or urinary extravagation	866.02	3
IV	Laceration	Parenchymal laceration extending through renal cortex, medulla, and collecting system	866.12	4
	Vascular	Main renal artery or vein injury with contained hemorrhage		4
V	Laceration	Completely shattered kidney	866.03	5
	Vascular	Avulsion of renal hilum which devascularizes kidney	866.13	5

*Advance one grade for bilateral injuries up to grade III
From Moore et al. [7]; with permission

AAST Organ Injury Severity Scale for the Kidney



Indications for renal trauma surgery

- Absolute
  - Hemodynamic instablity with shock
  - Expanding /pulsatile renal hematoma
  - Suspected renal pedicle avulsion (grade V)
  - UPJ disruption
- Relative (now rare)
  - Urinary extravasation with non viable tissue
  - Renal injury together with colon /pancreatic injury
  - Delayed diagnosis of arterial injury

Indications for angiography with embolisation

- Bleeding from renal segmental artery
- Unstable condition with grade III or IV
- AV fistula or pseudoaneurysm
- Persistent gross hematuria
- Blood loss extending 2 units in 24 hrs.

Management Options For Renal Trauma

- Close observation
  - Bed rest
  - Serial Hemoglobins
  - Antibiotics if urinary extravasation
- Radiographic Embolization
- Urinary Diversion
  - Ureteral Stenting
  - Nephrostomy Drainage
- Surgery
  - Renal Preservation / Reconstruction
  - Nephrectomy

Surgical considerations

- Midline transabdominal approach
- Early vascular control before opening gerotas fascia
- Landmark is IMA or in presense of large hematoma ,IMV.

Renal trauma in pediatric population

- Kidneys propotinally larger and less protected
- Less retroperitoneal and peritoneal fat
- Less musculature
- Higher sympathetic tone ie hypotention less reliable predictor of severity of renal injury.

Follow up

- Repeat CECT within 72 hrs
- Once pt is off hematuria and ambulatory ,discharged
- Adviced to avoid strenous activity for 4-6 weeks
- Follow up in opd after 3 weeks with USG and Hgm.

Bladder Trauma

Bladder: BLUNT: Overview

- Rarely isolated
- 80 -90 % have severe associated injuries
- Often high-energy injuries
- Associated with urethral rupture 10-29% and pelvic fracture 6-10%

Bladder: PENETRATING: Overview

- Incidence 2%
- Associated major abdominal injuries (35%) and shock (22%)
- Mortality high: 12%

Bladder: Diagnosis: Physical Signs

- Suspicion: required in cases of penetrating trauma, based on trajectory
- Physical signs:
  - Abdominal pain
  - Abdominal tenderness
  - Abdominal bruising
  - Urethral catheter does not return urine(gross hematuria in almost all cases)
  - Delayed?
    - Fever
    - No urine output
    - Peritoneal signs
    - ↑ BUN / Creatinine

Bladder: Diagnosis: Hematuria

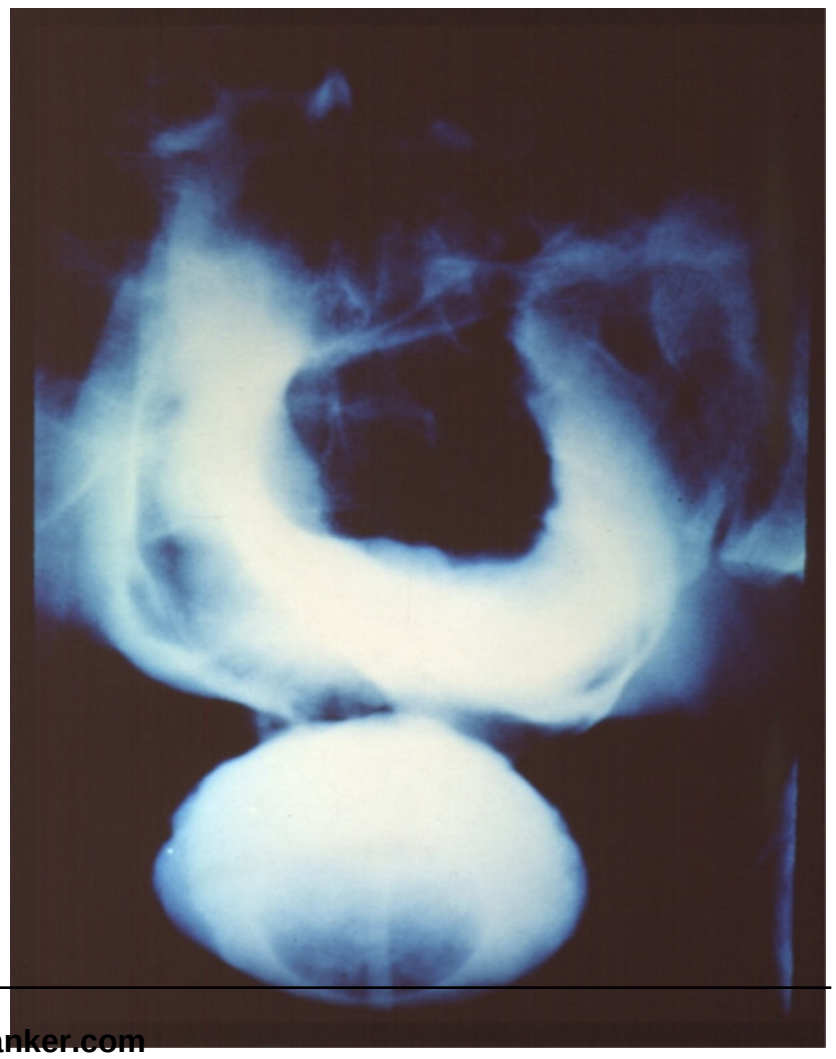
- Most (95%) have gross hematuria
- Microhematuria does occur: usually with minimal injury

Indications of imaging

- Absolute
  - Gross hematuria with pelvic fracture(30 % with bladder rupture)
  - Penetrating injury of lower abdomen with any degree of hematuria
- Relative
  - Gross hematuria without pelvic fracture
  - Microscopic hematuria with pelvic fracture

Bladder: Diagnosis Plain Cystography

- Nearly 100% accurate when done properly:
  - Adequate filling with 350 cc
  - Drainage films
- Use 30% contrast
- Underfilling (250 cc) associated with false negatives

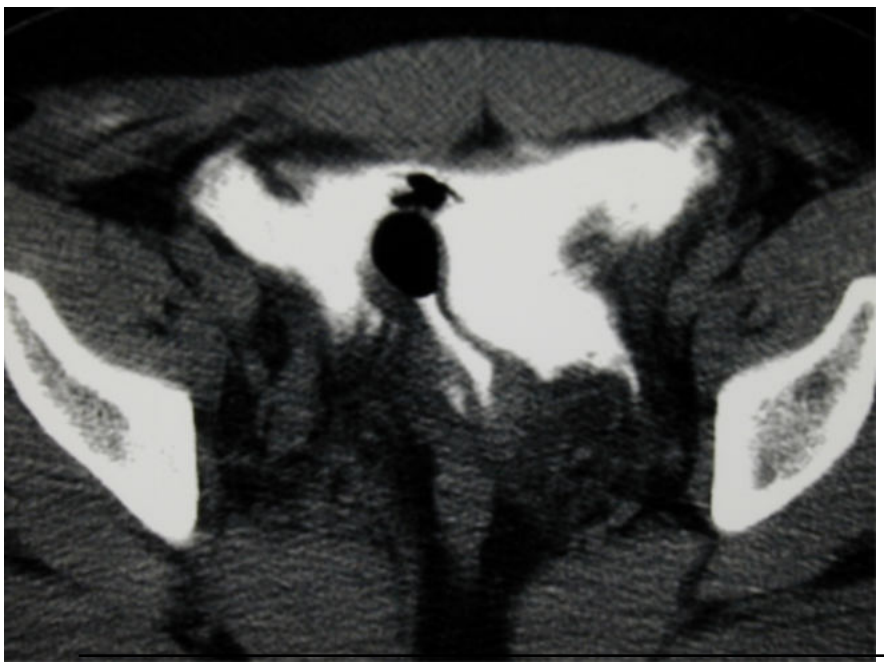


Bladder: Diagnosis CT Cystography

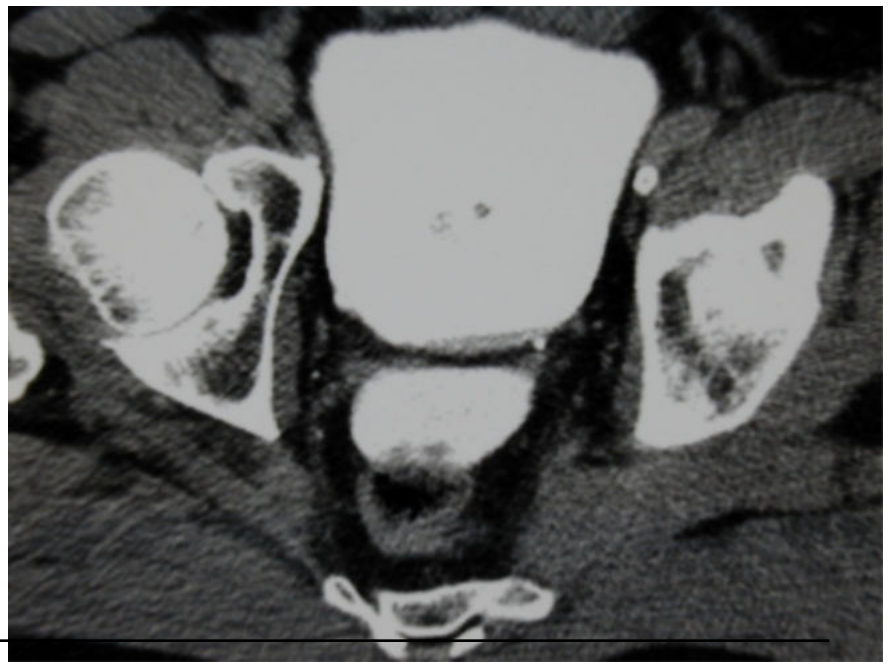
- Preferred, especially if already getting other CTs
- Antegrade filling by "clamping the Foley" is not OK!
- Must dilute contrast (6:1 with saline, or to about 2-4%)

Bladder: Diagnosis CT Cystography

Extraperitoneal



Intraperitoneal



Management (extraperitoneal bladder rupture)

- Uncomplicated cases: conservative management with catheter drainage.
- Large bore (22 fr) should be used.
- Catheter removal 2 weeks after cystogram
- Complications reported with conservative management (12% vs 5% with open repair) like fistula ,clot retntion and sepsis.

Management (intraperitoneal bladder rupture)

- All penetrating and intraperitoneal injuries should be managed with immediate open repair.
- Catheter removal 1 week after cystogram.

Key Points: Indications for Immediate Repair of Bladder Injury

- Intraperitoneal injury from external trauma
- Penetrating or iatrogenic nonurologic injury
- Inadequate bladder drainage or clots in urine
- Bladder neck injury
- Rectal or vaginal injury
- Open pelvic fracture
- Pelvic fracture requiring open reduction and internal fixation
- Selected stable patients undergoing laparotomy for other reasons
- Bone fragments projecting into bladder

Ureteral Injury

- No reliable Physical findings! Usually a retrograde diagnosis
- Non specific symptoms
  - Flank pain (36%-90%)
  - Fever
  - Ileus
  - Abdominal distension
  - fistula

Etiology

- External trauma
  - High speed blunt injuries
  - Penetrating trauma
- Surgical injury
  - Gynecological
  - Obstetric
  - General surgery(colorectal sx)
  - Urologic procedures

- Ureteroscopic injury

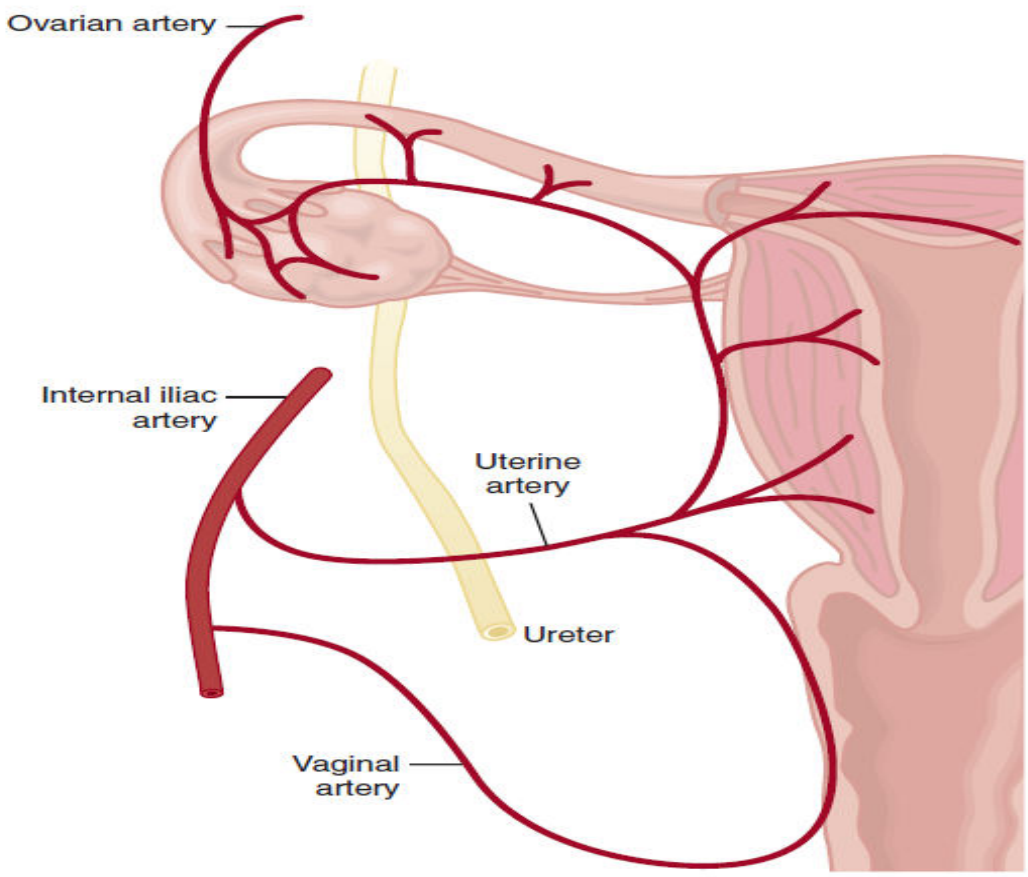


Figure 42–13. Ureteral anatomy showing relationship to fallopian tube and uterine artery.

Table 42–2.

American Association for the Surgery of Trauma Organ Injury Severity Scale for the Ureter

GRADE*	TYPE	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 with >2 cm devascularization

*Advance one grade for bilateral up to grade III.

From Moore EE, Cogbill TH, Jurkovich GJ, et al. Organ injury scaling. III: chest wall, abdominal vascular, ureter, bladder, and urethra. J Trauma 1992;33:337–9.

Diagnosis

- Presense of hematuria(non specific)
- Imaging
  - IVU
  - CT urogram
  - RGP
  - Antegrade ureterography
- Intraoperative recognisation

Hematuria and ureteral injury

- Nonspecific indicator
- 25 – 45% patients donot demonstrate even microscopic hematuria.
- Being suspicious for it is the only way you will catch it.

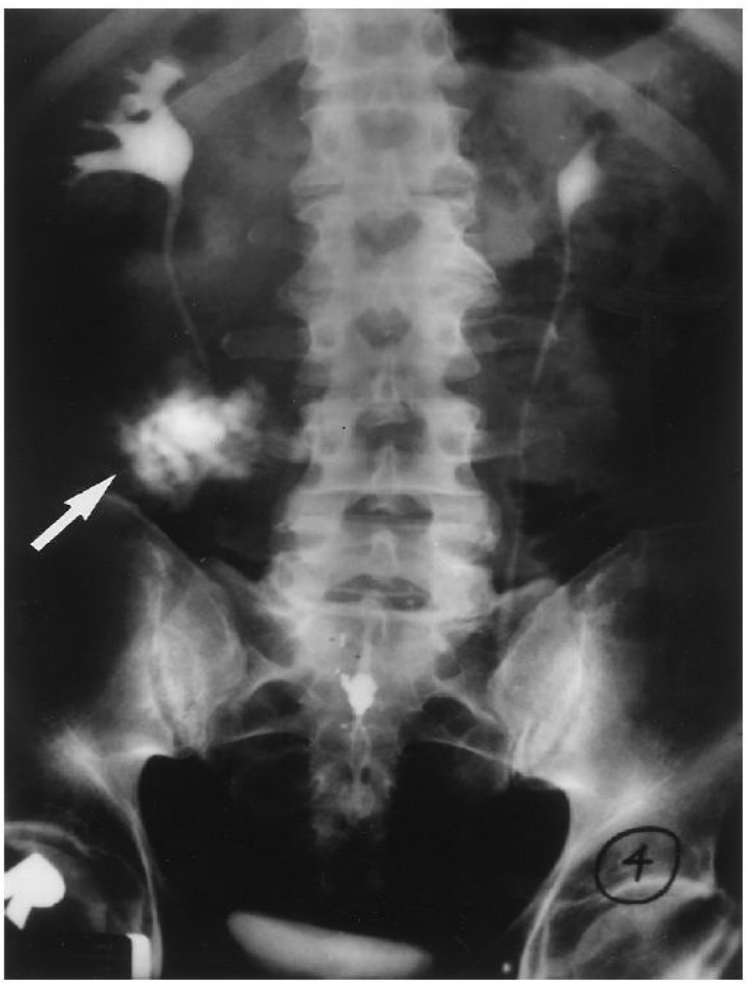
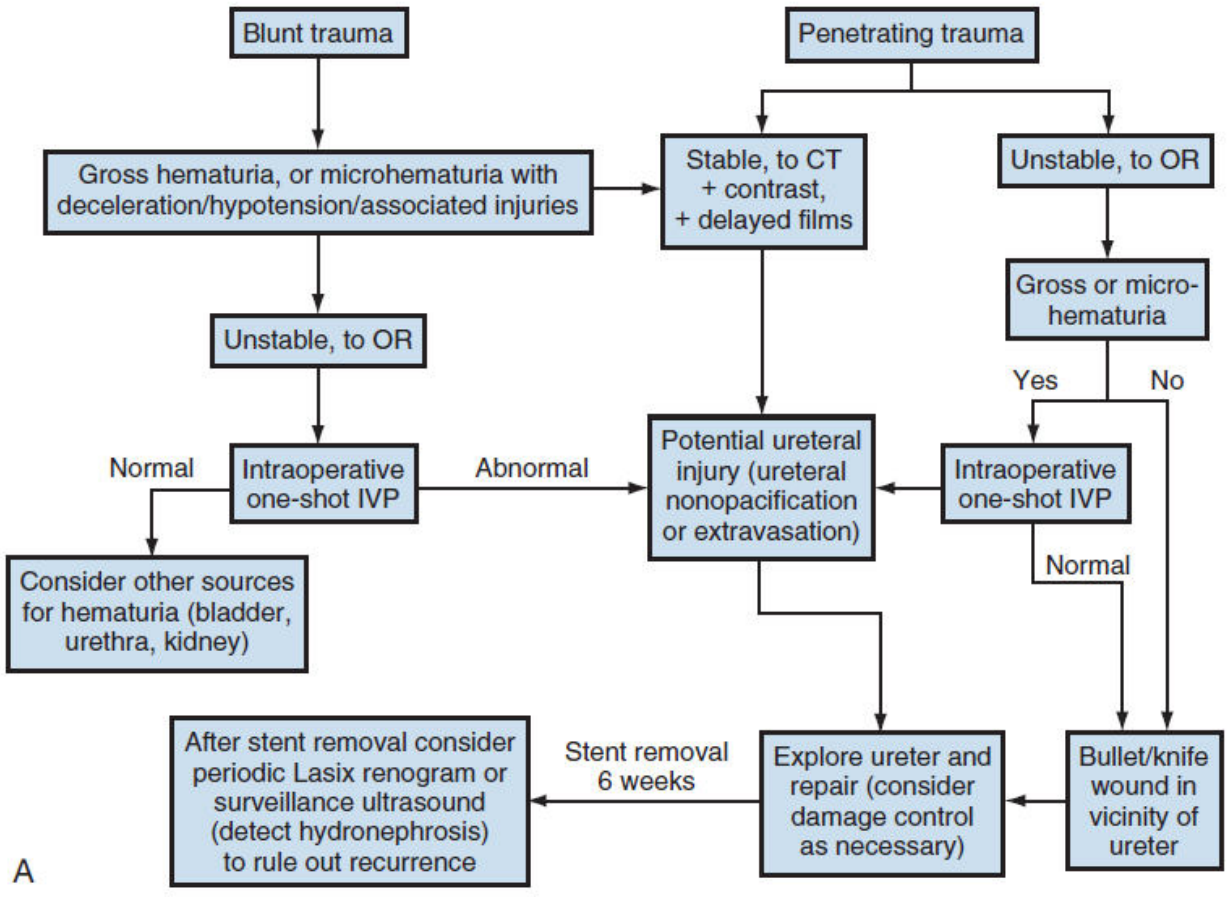


Figure 42–14. Excretory urography demonstrating extravasation in the upper right ureter consequent to stab wound. Note lack of contrast *(arrow)* in the ureter below the site of injury, indicating complete ureteral transection.

Figure 42–12. Retrograde pyelography demonstrating uretero-

Management



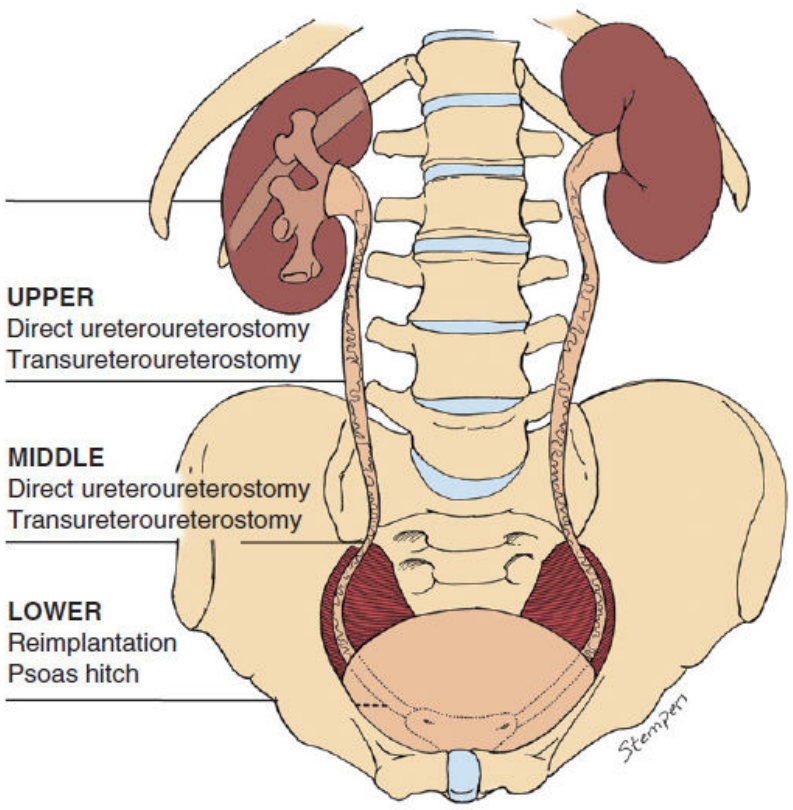
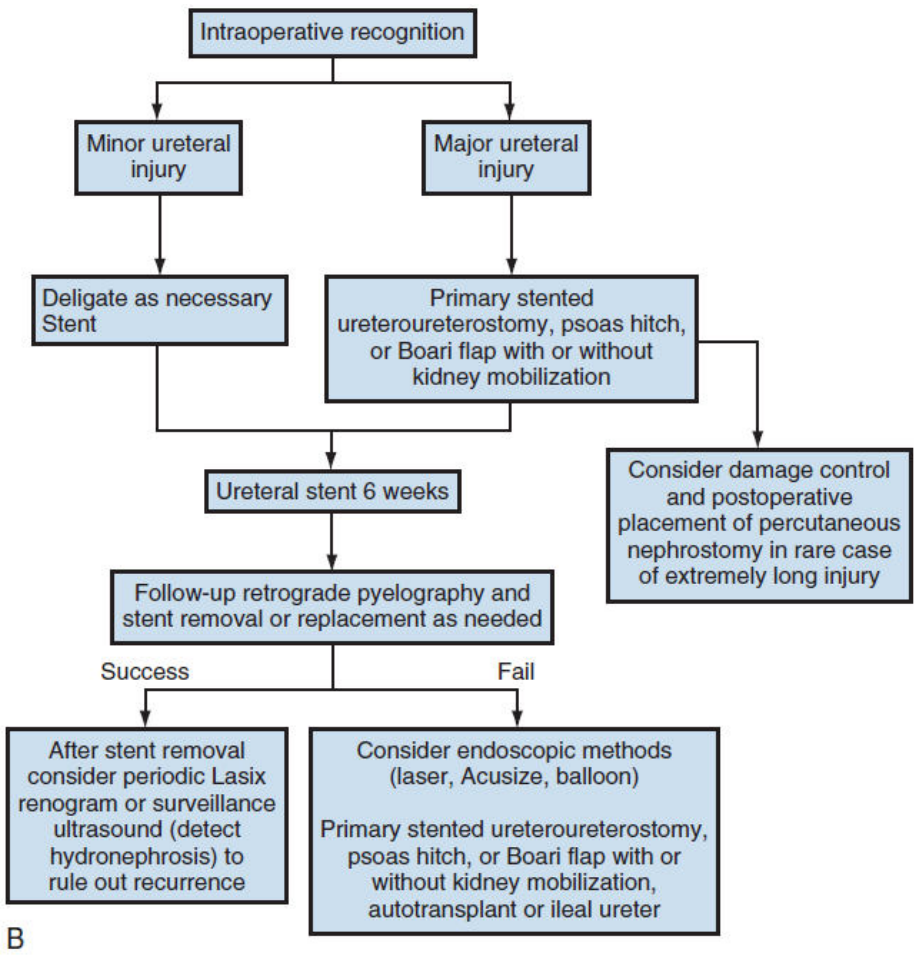
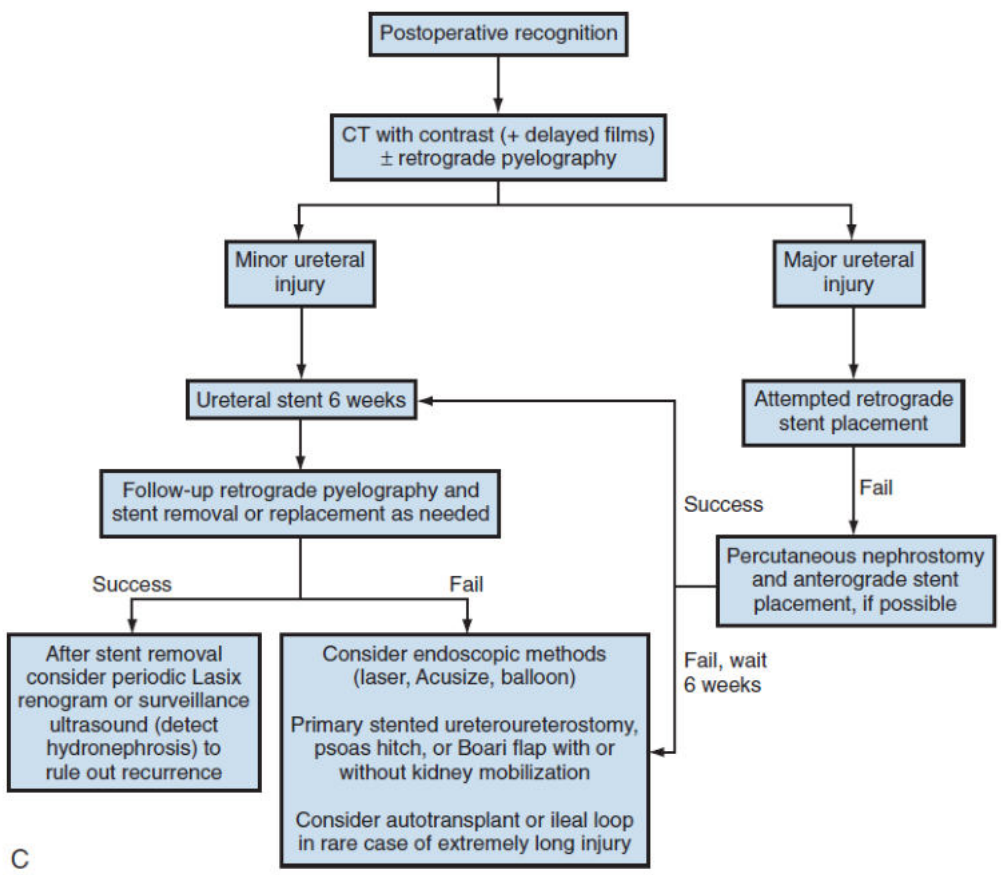


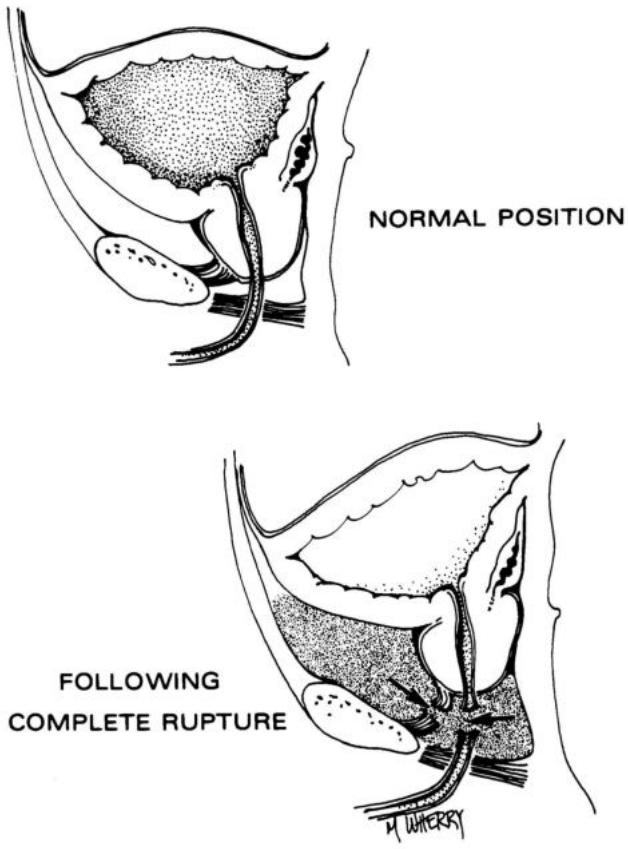
Figure 42–15. Suggested management options for ureteral injuries at different levels.





gure 42–17, cont'd. C, discovered postoperatively. CT, computed tomography; IVP, intravenous pyelography; OR, operating room.

Posterior Urethral Injuries



Posterior Urethra Trauma: Etiology

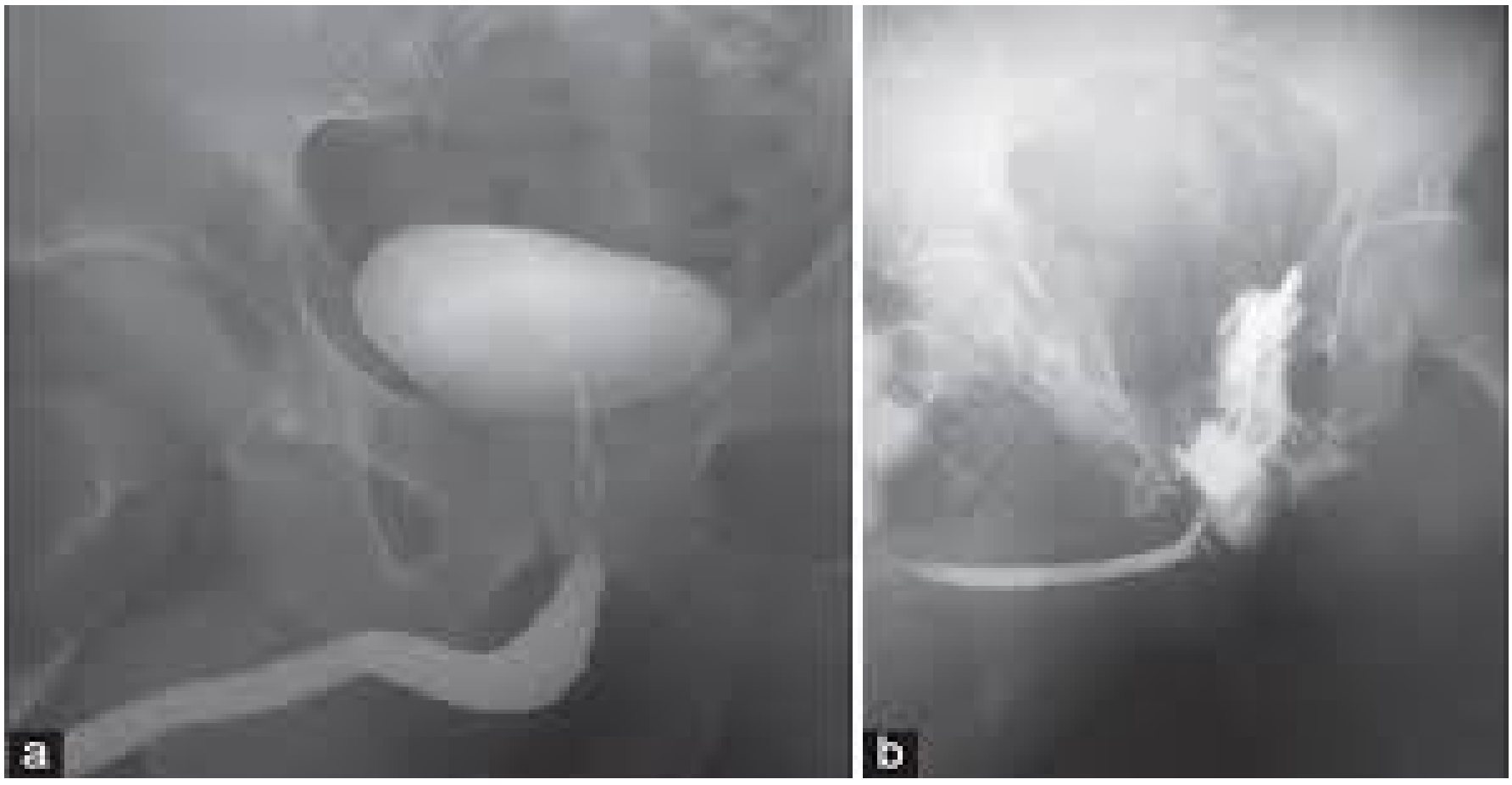
- 4-14% of pelvic fractures
- Bilateral pubic rami fractures (straddle fracture) and sacroiliac diasthasis
- Mostly males, but can happen in females
- Associated bladder rupture in 10-17%
- Rectal injury can lead to urethral-rectal fistula in 8%

Posterior Urethra Trauma: Diagnosis

- Blood at meatus: 50%
- Inability to urinate
- Palpable full bladder
- Inability to place urethral catheter
- High riding prostate : 34%
- Rarely, perineal hematoma (late finding)

- Rarely females develop proximal urethral injury
- Presents with vulvar edema and blood at vaginal introitus

Retrograde Urethrogram



Management

- Immediate open reconstruction(curently no role)
- Suprapubic cystostomy
- Primary realignment
- Delayed reconstruction
  - Endoscopic treatment
  - Surgical reconstruction

Anterior urethral injury

- Are often isolated
- Majority after stradle injury
- Involve bulbar urethra
- Presents with blood at meatus,perenial hematoma,gross hematuria n urinary retention

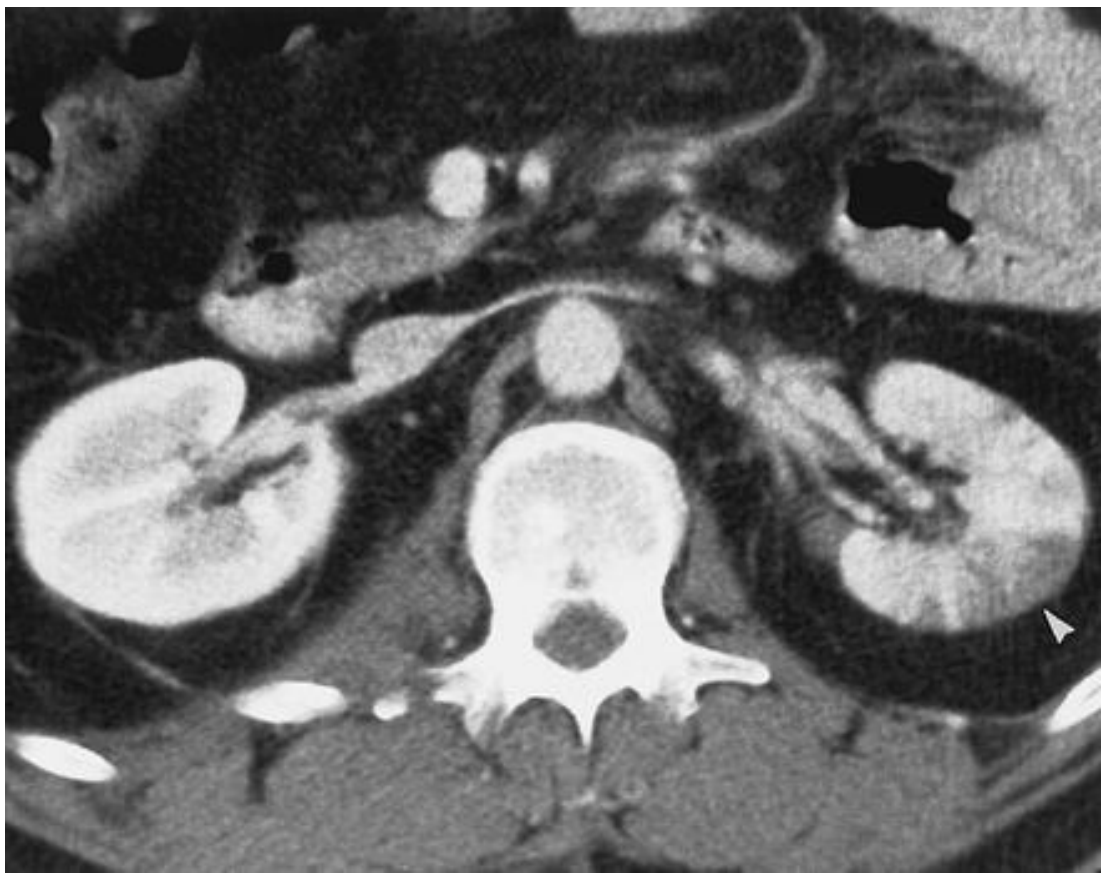
Table 1 – Classification of blunt anterior and posterior urethra with management according to injury grade

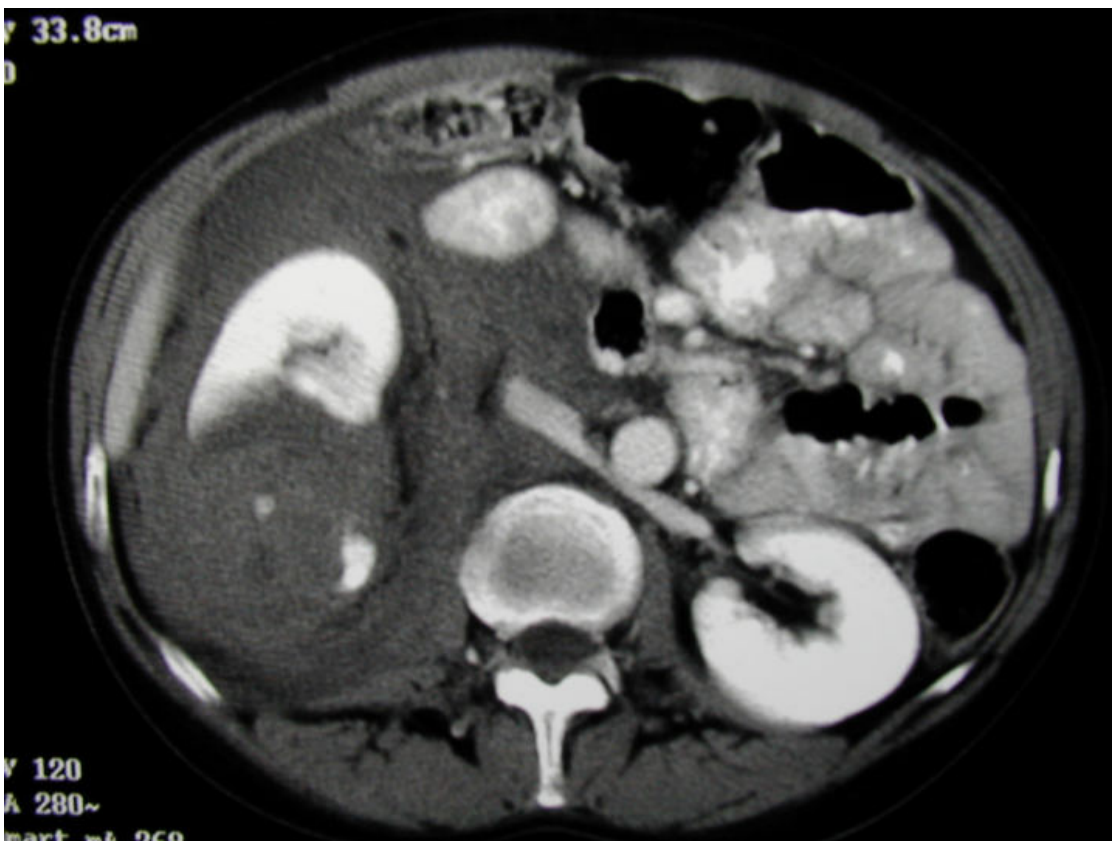
Grade	Description	Appearance	Management
I	Stretch injury	Elongation of the urethra without extravasation on urethrography	No treatment required
II	Contusion	Blood at the urethral meatus; no extravasation on urethrography	Grades II and III can be managed conservatively with suprapubic cystostomy or urethral catheterization
III	Partial disruption	Extravasation of contrast at injury site with contrast visualized in the proximal urethra or bladder	
IV	Complete disruption	Extravasation of contrast at injury site without visualization of proximal urethra or anterior urethra or bladder	Suprapubic cystostomy and delayed repair or primary endoscopic realignment in selected patients ± delayed repair
V	Complete or partial disruption of posterior urethra with associated tear of the bladder neck, rectum or vagina	Extravasation of contrast at urethral injury site ± presence of blood in the vaginal introitus in women. Extravasation of contrast at bladder neck during suprapubic cystography ± rectal or vaginal filling with contrast material	Primary open repair

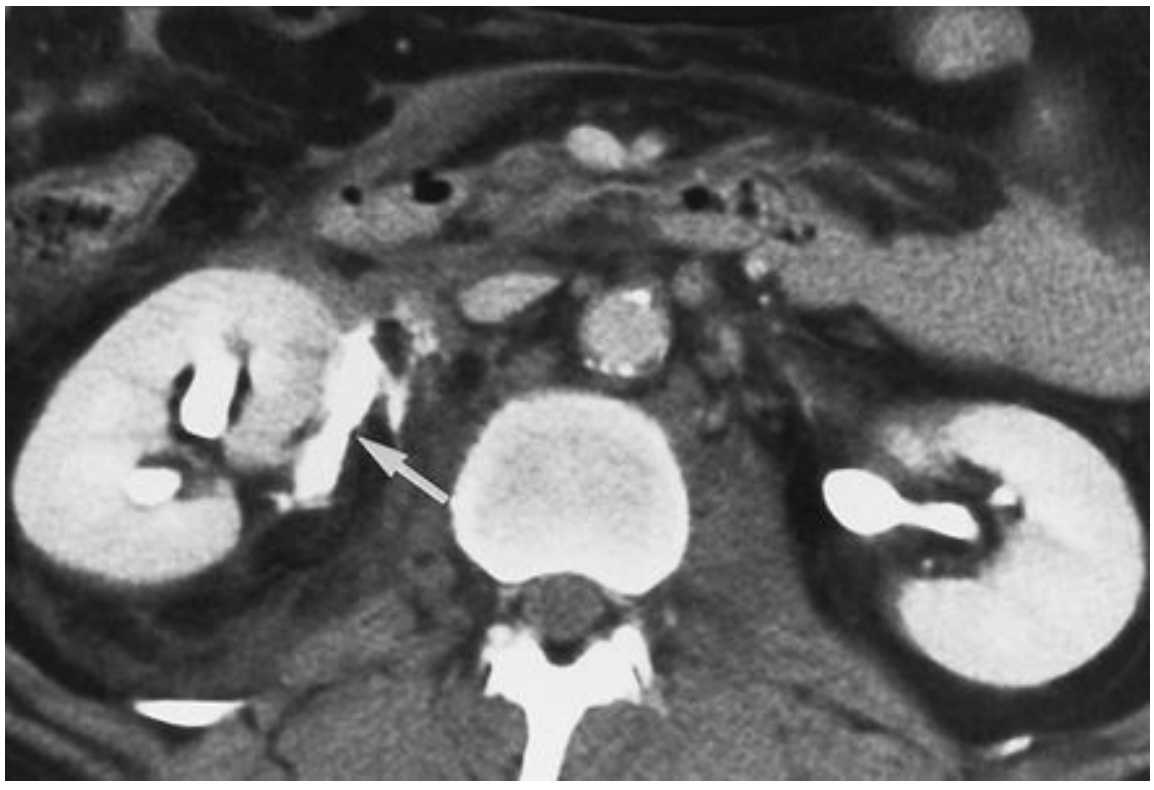
Complications

- Erectile dysfunction
  - 50%
  - Cavernosal nerve injury
  - Arterial insufficiency
  - Venous leak
  - Direct corporal injury
- Recurent stenosis(5-15%)
- Incontinence after reconstruction <4%

QUIZ (Grades of Renal Injuries)







Thanks