

Urology Trauma

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Urological trauma contents:

Introduction

Renal trauma

Ureteral injuries

Bladder injuries

Urethral injuries

Genital trauma :

1. Testicular trauma
2. Penile fracture

Introduction

The GU system may be divided into three regions:

1. The upper tract includes the renal arteries, the kidneys, and the ureters.
2. The lower tract consists of the bladder, the prostate, and the posterior urethra.
3. The external portion consists of the anterior urethra, penis, scrotum, and testicles in the male

History

Attempt to obtain a detailed history of the trauma from the patient or from witnesses and emergency personnel. In falls, the height from which the victim has fallen and the nature of the landing surface are important.

History

In gunshot wounds, the type of weapon, caliber of the projectile, and distance from the victim at which the shot was fired can be used to estimate the extent of tissue damage

In motor vehicle accidents, the speed of the vehicle, location of the victim within the automobile, and use of seat belts are important

Physical examination

Hemodynamic instability requires:

1. aggressive resuscitation
2. emergency surgical exploration in many cases.

Physical findings of

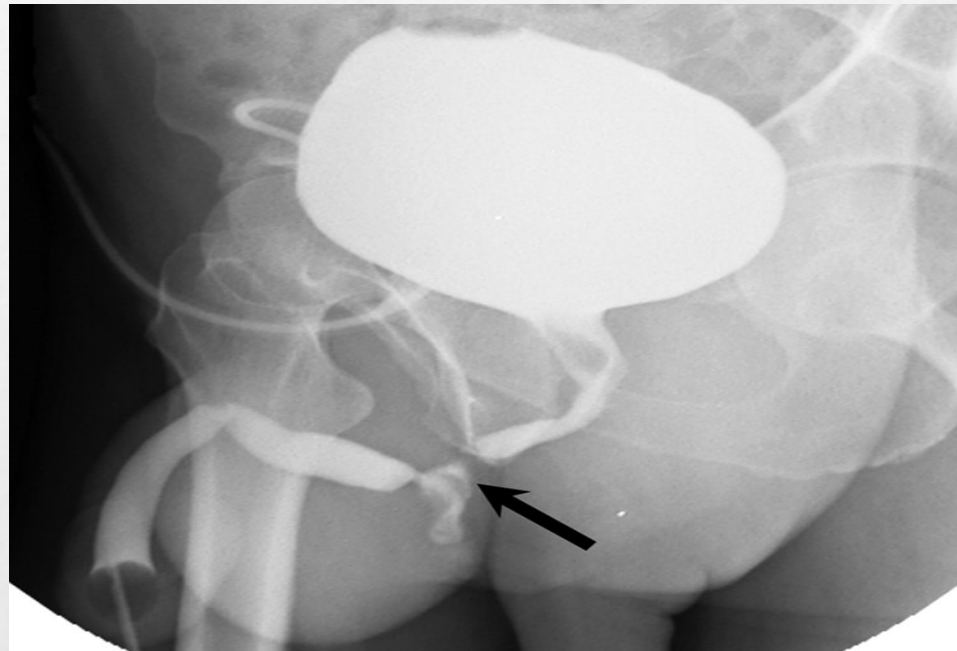
3. Tenderness
4. Ecchymosis
5. penetrating injuries

(in the flank, suprapubic region, pelvis, or external genitalia strongly suggest an underlying urologic injury)

Pelvic bony instability indicates a likely pelvic fracture and should alert the trauma team to the possibility of urethral or bladder injury.



1. Gross blood at the urethral meatus
2. Superior displacement of the prostate on rectal examination are indicative of possible urethral injury.



Radiologic examination

1. Plain films of the abdomen:

May reveal bony fractures of the pelvis, ribs, or vertebrae.

Loss of the perirenal outline, loss of the psoas shadow, or displacement of bowel gas may indicate retroperitoneal hematoma or urinoma

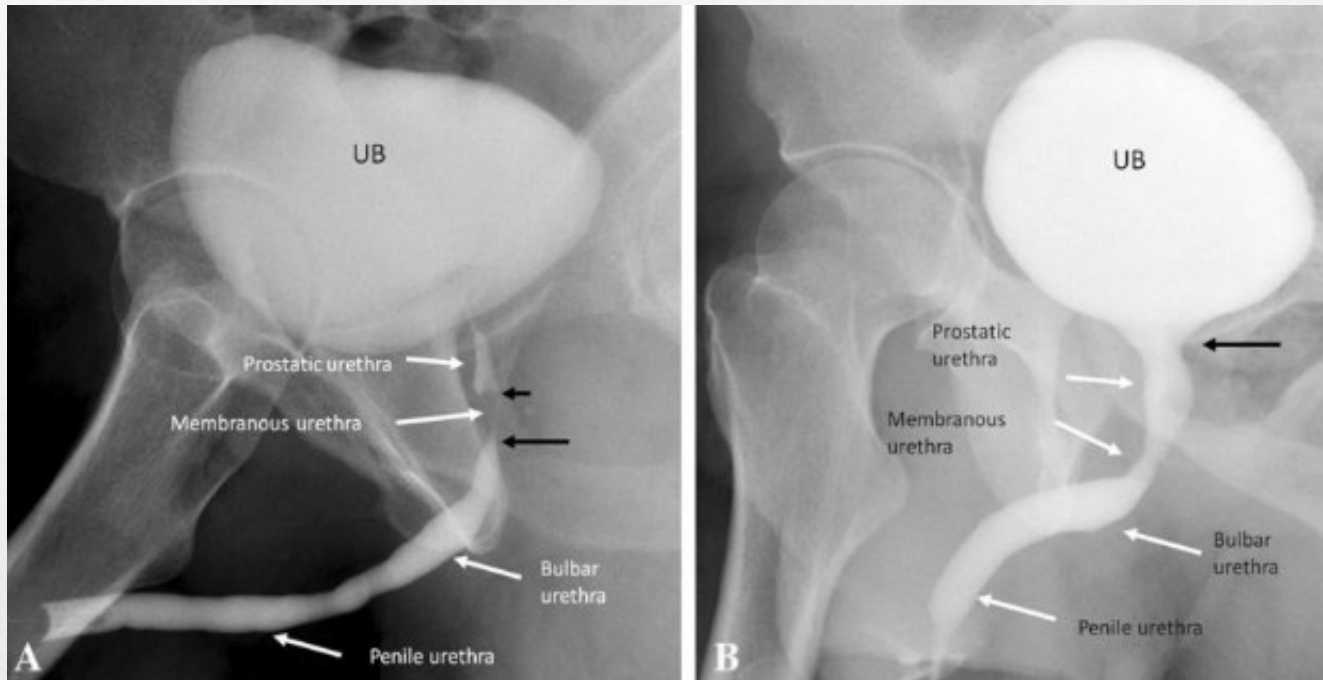
2- Retrograde urethrogram

Is indicated whenever urethral injury is suggested by :

1. the presence of blood at the meatus
2. superior displacement of the prostate on PR
3. pelvic fracture
4. inability to pass a urethral catheter

The presence of extravasation is indicative of urethral injury.

Retrograde urethrogram



3- Cystography

Is indicated to rule out bladder injury in all patients with blunt or penetrating trauma

Regardless of the technique used, it is essential that the bladder be completely filled with contrast agent to demonstrate small amounts of extravasation



Cystography

Extravasation from the bladder may be missed on intravenous urogram (IVU) or CT scan if the bladder is incompletely distended.

Allow contrast agent to flow through the urethral catheter under gravity until the bladder is full; at least 250 mL is often required. After the bladder is emptied, a postvoid film is vital to assess extravasation located behind the bladder

4- CT with intravenous contrast agent

The golden standard of trauma assessment

It provides an excellent assessment of

1. renal parenchymal integrity
2. injury to other organs in the abdomen
3. the presence of hematomas or urinomas

CT can also establish the presence of both kidneys and their excretory function

5 - Ultrasonography

US permits noninvasive assessment of perirenal and subcapsular hematomas.

Is useful in following patients with renal trauma who are being managed nonsurgically.

6 - IVU

Is no longer recommended as the initial screening examination

IVU may be useful in patients with traumatic hematuria if CT is not available

IVU is essential before any exploration of the kidneys to evaluate the contralateral side

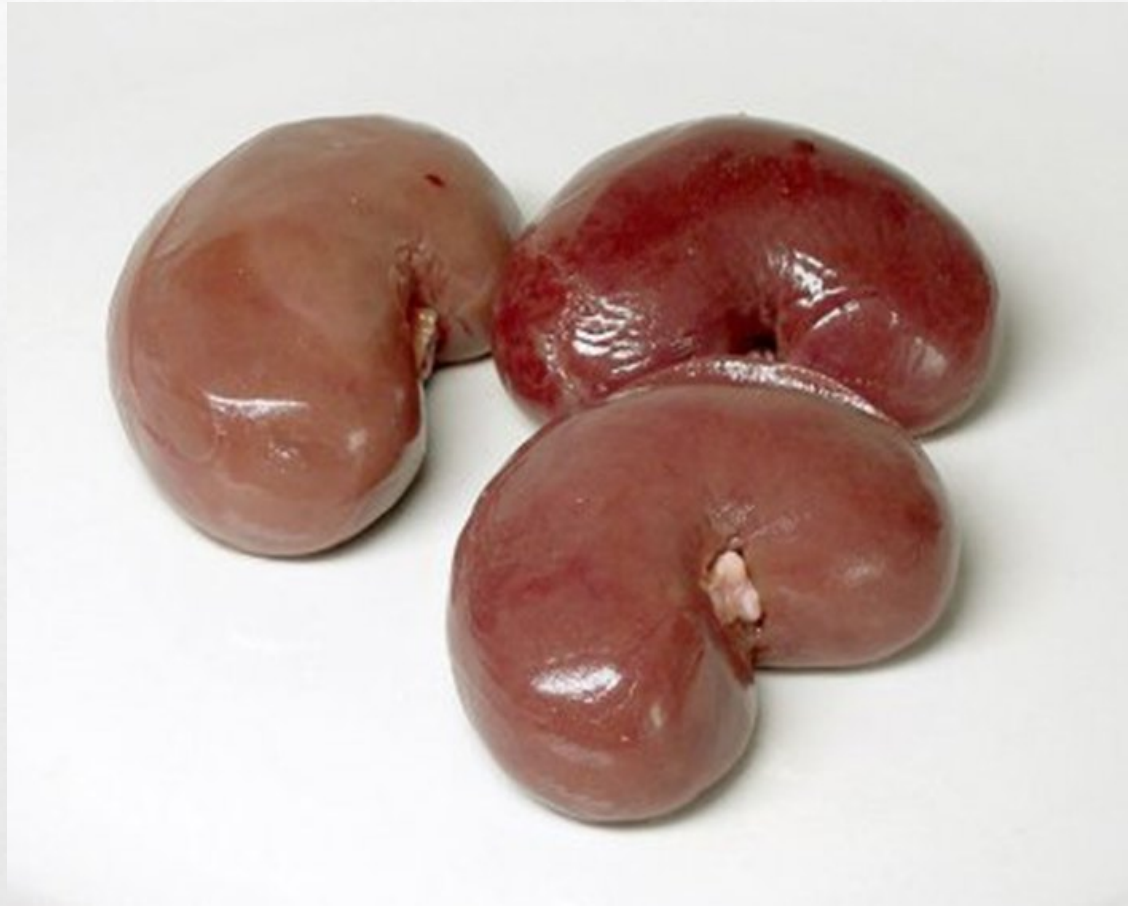
IVU

After a scout film of the abdomen has been obtained, contrast agent (a dose of 1 mL/kg) is injected intravenously by hand during 3 to 5 minutes

A film is taken at 5 to 10 minutes after injection of contrast agent

Adequate visualization of the kidneys may not be obtained on IVU unless the patient has a stable systolic blood pressure above 90 mm Hg

Kidney trauma



Renal trauma accounts for approximately 50% of all cases of GU trauma

There is a male-to-female predominance of 4:1

In children aged 5 to 15, the most common cause of renal injury is bicycle riding.

The kidneys are relatively well protected by the bony rib cage, lumbar spine, and vertebral muscles.

However, trauma sufficient to fracture a rib or vertebral process often is accompanied by trauma to the kidney

Blunt trauma accounts for >80% of all renal injuries.

Rapid deceleration such as commonly occurs in motor vehicle accidents or falls may cause tears in the renal artery intimal layer or even complete avulsion.

Penetrating trauma is most commonly caused by knife and bullet wounds.

Approximately 85% of instances of penetrating trauma involving the kidney are associated with injury to other intra abdominal organs

Children are especially prone to renal injury because of the underdevelopment of the back muscles and rib cage and because the kidneys are relatively larger than in adults.

In addition, the kidneys in children are not as well protected by perirenal fat and Gerota's fascia, which can act as a buffer against trauma.

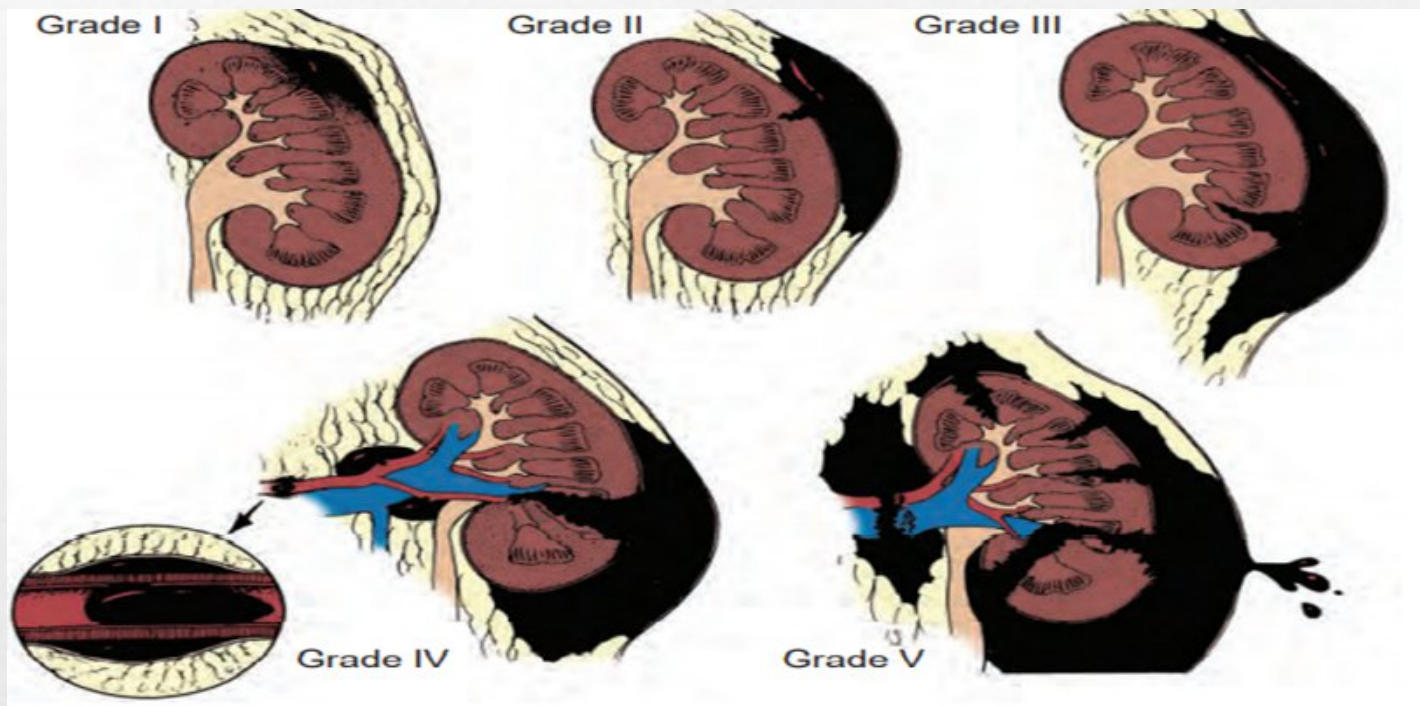
Renal injury is more likely in the presence of pre-existing conditions such as hydronephrosis or tumours

Classification of renal injury

TABLE 90.1 American Association for the Surgery of Trauma Organ Injury Severity Scale for the Kidney

GRADE ^a	TYPE	DESCRIPTION
I	Contusion	Microscopic or gross hematuria, urologic studies normal
	Hematoma	Subcapsular, nonexpanding without parenchymal laceration
II	Hematoma	Nonexpanding perirenal hematoma confined to renal retroperitoneum
	Laceration	<1 cm parenchymal depth of renal cortex without urinary extravasation
III	Laceration	>1 cm parenchymal depth of renal cortex without collecting system rupture or urinary extravasation
IV	Laceration	Parenchymal laceration extending through renal cortex, medulla, and collecting system
	Vascular	Main renal artery or vein injury with contained hemorrhage
V	Laceration	Completely shattered kidney
	Vascular	Avulsion of renal hilum, devascularizing the kidney

Classification



Grade 1 injury (renal contusion)

Is bruising of the renal parenchyma without true parenchymal disruption

An associated subcapsular hematoma may be present, but the kidney is intact.

Such injuries account for the majority of cases of blunt renal trauma.

Grade 2 injury

Grade 2 injury involves ruptures or tears of the renal capsule and parenchyma that are <1 cm in length (nonexpanding perirenal hematoma may be present)

The injury does not involve the collecting system or the medulla of the kidney (no urinary extravasation).

Grade 1 and 2 injuries are classified as minor injuries and account for 85% of all renal injuries

Grade 3 - 4

Grade 3 injury is the same as grade 2 injury but extends >1 cm (no urinary extravasation)

Grade 4 injury is a major laceration that extends into the collecting system and produces extravasation of urine.

Involvement of a segmental vessel also qualifies as a grade 4 injury

Grade 5

Severe multiple lacerations, fracture, shattering of the kidney, and avulsion of the renal hilum are all examples of grade 5 injury. Grade 3, 4, and 5 injuries are classified as major injuries.

Diagnosis

Patients who are hemodynamically unstable will almost always need to be surgically explored quickly.

The urologist is often called to the operating room for consultation after the patient has been explored by the general surgeon

In patients who are hemodynamically stable, CT is the preferred initial radiologic

Treatment

All patients with penetrating trauma should undergo surgical exploration .

Nonoperative management is the standard of care in hemodynamically stable, well-staged patients with AAST grades I to IVa renal injuries, regardless of mechanism.

Operative Management

Absolute indications include :

(1) hemodynamic instability with no or transient response to resuscitation, (2) expanding/pulsatile renal hematoma (usually indicating renal artery laceration), (3) suspected renal vascular pedicle avulsion, and (4) ureteropelvic junction avulsion.

Relative indications are (1) urinary extravasation with significant renal parenchymal devascularization. (2) renal injury together with colon/pancreatic injury. (3) arterial thrombosis, and (4) urinary extravasation from parenchymal injury

Surgical management of penetrating renal trauma consists of

- obtaining adequate hemostasis
- debriding devitalized tissue
- repairing the collecting system
- providing adequate drainage.

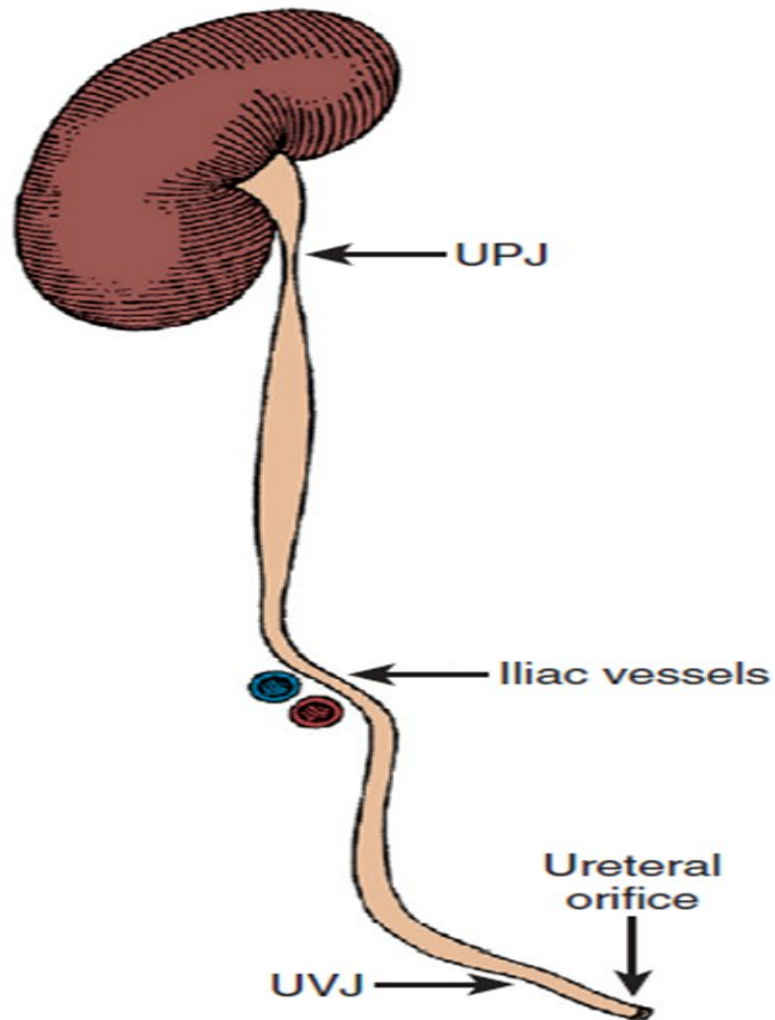
When the treatment is impossible,
nephrectomy is indicated

Complications of renal injury

1. Delayed bleeding
2. Hypertension
3. Formation of arteriovenous fistulas
4. Hydronephrosis
5. Loss of renal parenchyma

The patient's blood pressure should be monitored carefully during the first 6 months after injury.

Ureteral injury



Trauma to the ureter is almost penetrating trauma, and blunt trauma to the ureter is extremely rare

The most common cause of ureteral trauma is iatrogenic injury during pelvic surgery, in particular abdominal hysterectomy

The second most common cause is gunshot wound

All portions of the ureter are at equal risk for penetrating trauma from gunshot wounds

Diagnosis

Iatrogenic injury

Any patient in whom

1. Flank pain
 2. Fever
 3. Paralytic ileus develop during the first 10 days following intraabdominal or pelvic surgery
- should be suspected of having ureteral injury

In female patients, a ureterovaginal fistula may develop after ligation of the ureter during hysterectomy.

IVU or CT will demonstrate delayed excretion, hydronephrosis, and sometimes extravasation of contrast material

External penetrating injury.

Hematuria is present in approximately 80% ,but the absence of hematuria does not rule out penetrating ureteral injury.

The diagnosis is usually apparent on IVU.

The injury can be well delineated with a retrograde pyelogram, however, this study should be performed immediately before surgical exploration.

Treatment

Depends on whether the injury is recognized immediately or after some period of delay.

Immediate recognition.

Injuries diagnosed within a few days should generally be treated with surgical exploration

Primary anastomosis should be performed whenever possible.

Injuries involving the lower third of the ureter can generally be managed by reimplantation into the bladder

An internal stent should be provided until healing is complete (usually 3 to 4 weeks).

Delayed recognition

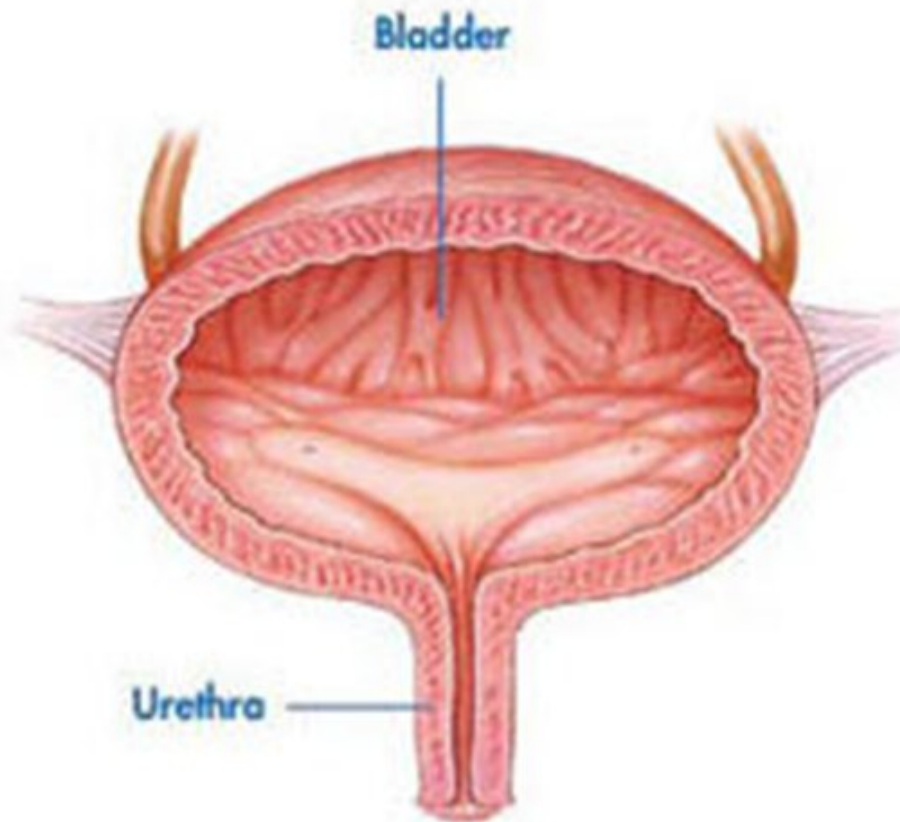
The presence of infection usually prevents primary reconstruction; urinary diversion by percutaneous nephrostomy and drainage of any urinary collection are the initial steps.

Reconstructive surgery is undertaken after the hydronephrosis and infection have resolved

Complications of ureteral injury

1. ureteral stricture
2. retroperitoneal fibrosis
3. Pyelonephritis
4. ureterocutaneous fistula

Bladder injury



The bladder normally is protected from injury by the bony pelvis; however, the bladder and/or the urethra are frequently injured when the pelvis is fractured.

Severe blunt trauma to the lower abdomen may result in bladder rupture if the bladder is filled at the time of trauma.

Penetrating trauma to the bladder may occur

Classification

1. Contusion

involves injury to the bladder wall, resulting in hematuria and perivesical hematoma with no extravasation of urine demonstrated.

2. Extraperitoneal rupture.

In this injury, the lateral wall or floor of the bladder is ruptured, leading to extravasation of urine into the pelvis and retroperitoneum.

This type of injury accounts for approximately 50% of all bladder ruptures and is almost always associated with pelvic fracture.

Conversely, approximately 15% of patients with pelvic fracture have bladder rupture

3. Intraperitoneal rupture

usually involves bladder rupture at the dome, leading to intraperitoneal extravasation of urine.

This type of injury is almost always caused by blunt trauma to the lower abdomen and is often seen in intoxicated patients who fall with a full bladder or are involved in a motor vehicle accident

4. Spontaneous rupture.

Rarely, the bladder ruptures without external trauma, usually indicating underlying pathology such as bladder tumor

Diagnosis

Extraperitoneal rupture is characterized by the presence of contrast agent outside the bladder in the pelvis and paracolic areas.

Intraperitoneal rupture is characterized by the presence of contrast agent in the peritoneal cavity, outlining loops of small bowel

Treatment

1. Exploration
2. Debridement
3. surgical repair
4. Drainage of the perivesical space
5. Diversion of urine usually by a suprapubic catheter.

Following repair, a low-pressure cystogram should be obtained to assess the integrity of the bladder before the catheter is removed.

Extraperitoneal rupture

Many patients may be successfully treated by urethral catheter drainage alone provided that

only a minor degree of extraperitoneal extravasation is present

there is no evidence of infected urine

the patient is carefully monitored

Intraperitoneal rupture

Requires a transperitoneal approach to rule out associated injuries and to permit removal of extravasated urine from the peritoneal cavity.

With penetrating trauma, concomitant injury to the rectum, iliac vessels, or ureters should be ruled out during surgical exploration

Complications of bladder injury

1. Cystitis
2. Sepsis
3. pelvic collection
4. vesicovaginal fistula.

Urethral injury

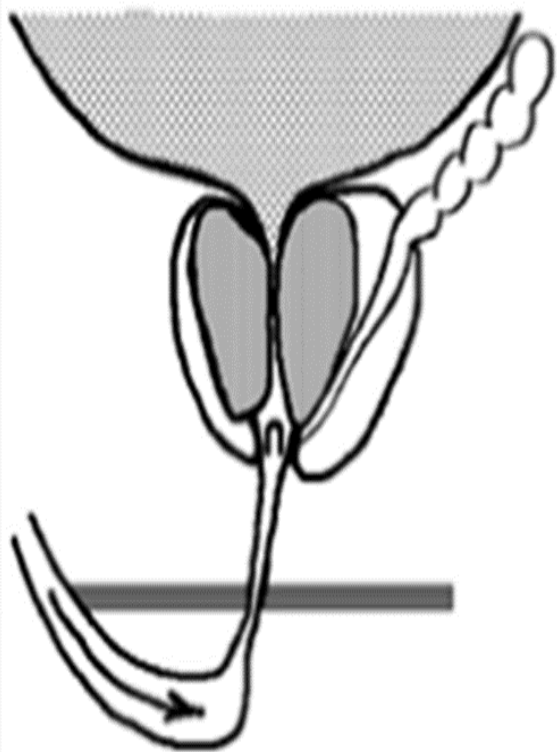
Classification on urethral injury:

According to extent of injury:

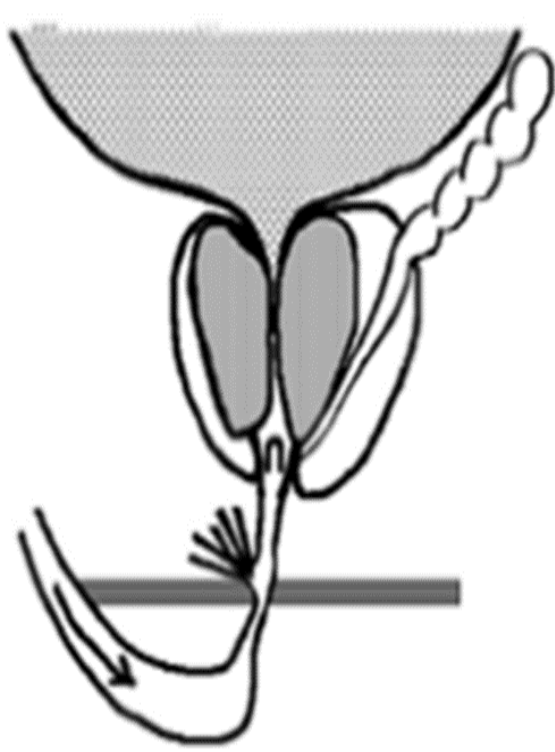
1. Contusion or stretching (no extravasation)
2. Partial urethral tear
3. Complete urethral transection

According to location :

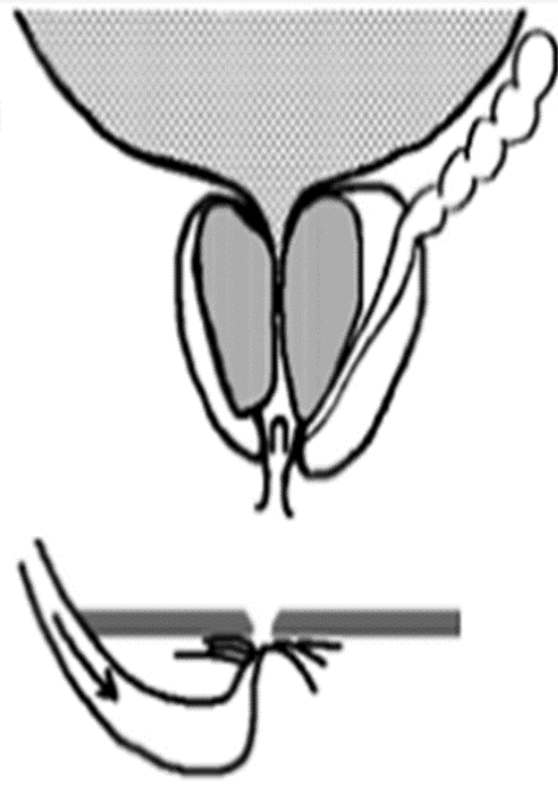
4. Anterior urethral injury (penile + bulbar)
5. Posterior urethral injury (membranous+prostatic)



Type I



Type II



Type III

Anterior urethral injury

Occurs most often as a result of blunt trauma suffered during straddle-type falls in which the urethra is crushed against the pubic bones.

The patient gives a history of trauma to the perineum followed by perineal pain and inability to void.

Almost, a bloody urethral discharge is present.

If Buck's fascia is not ruptured, the ecchymosis is limited to the penis.

If Buck's fascia is ruptured, the extent of the ecchymosis is limited by Colles' fascia in the perineum and by Scarpa's fascia in the abdomen

Posterior urethral injuries

Are usually associated with pelvic fractures.

The incidence of urethral injury in pelvic fracture cases is 5% to 10% in males and 1% to 5% in females.

The more severe the fracture of the pelvis, the higher risk of urethral injury exists.

Diagnosis

Retrograde urethrography is usually performed with the patient in the 45-degree oblique position and the penis stretched perpendicular to the femur.

Retrograde urethrography is quite accurate in diagnosing the presence and type of urethral disruption

Treatment

Anterior urethral contusion

Anterior urethral contusion may be treated nonoperatively.

If the patient is able to void without significant hematuria, no treatment is needed.

If there is significant bleeding, urethral catheterization for several days is usually sufficient

Anterior urethral laceration

Is best treated by diverting the urine by suprapubic cystotomy (open or percutaneous).

In the absence of significant extravasation, conservative treatment will result in spontaneous healing in most cases

Posterior urethral injury

Stretch injury (type I) and incomplete urethral tears (type II) are best treated by stenting with a urethral catheter.

The case with complete rupture remains a difficult problem because the patient is at varying risk of

1. urethral stricture
2. urinary incontinence
3. erectile dysfunction (ED)

Genital trauma testicular trauma

Testicular injury results from blunt trauma in ~75% of cases, resulting in rupture of the tunica albuginea, contusion, hematoma, dislocation, or torsion of the testis.

The testis may also rupture spontaneously or with minimal trauma if underlying pathology, especially carcinoma

Most patients complain of severe scrotal pain and nausea. Swelling and ecchymosis are variable. Scrotal or perineal ecchymosis may be present US should be performed to assess the integrity and vascularity of the testis in blunt trauma

Treatment

Exploration should not be delayed in penetrating scrotal trauma given the low sensitivity of US in these injuries.

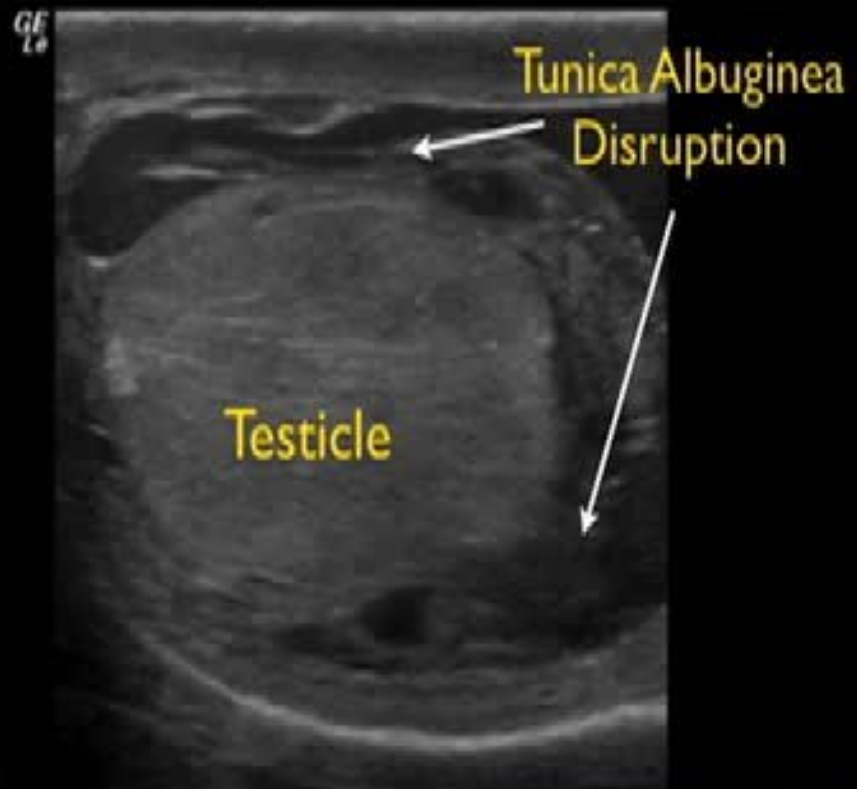
Early exploration and repair of testicular injury is associated with increased testicular salvage, reduced convalescence and disability, faster return to normal activities, and preservation of fertility and hormonal function

Testicular Fracture with Rupture

Normal Testicle



Injured Testicle



Penile fracture



PENILE FRACTURE

Disruption of the tunica albuginea with rupture of the corpus cavernosum. It is the result of blunt traumatic injury that typically occurs during vigorous sexual intercourse when the rigid penis strikes the perineum or pubic bone of the partner and results in a buckling injury.

The clinical signs and symptoms of penile fracture consist of :

1. sudden onset of sharp pain after popping or cracking sound
2. Swelling & Ecchymosis (**eggplant deformity**)
3. deviation of the penis away from the side of the injury
4. spontaneous loss of erection during sexual intercourse

If signs for urethral injury are present (hematuria or urinary retention), the urethra should be staged with a retrograde urethrogram or cystoscopy.

Most cases of penile fracture will require surgical exploration of the injury to debride devitalized tissue, evacuate hematoma, and close the defect in the tunica albuginea

Thank
You

