# Objectives:

1. Describe the acute (emergency room) evaluation of a patient with blunt abdominal trauma and gross hematuria.
2. State the indications for CT scan of the urinary tract in cases of blunt abdominal trauma.
3. State the indications for surgery in cases of blunt renal trauma.
4. State the two different kinds of bladder rupture and the mechanisms by which they occur.
5. Discuss the acute urologic evaluation of a male with a pelvic fracture and blood at the urethral meatus.
6. Discuss the acute urologic evaluation of a male with a blunt injury to the perineum ("straddle injury") and blood at the urethral meatus.

As in any patient it is important to gain as thorough a history of the incident as possible. The location of the blunt injury or penetrating injury, as well as the location of pain and any other symptoms are important factors for determining the work-up and management of trauma patients.





# a. Blunt Renal Trauma:

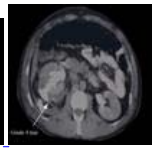
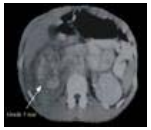
In Canada, blunt abdominal trauma accounts for over 90% of renal injuries with stab wounds and gun shot wounds seen much less often. The most common scenarios are motor vehicle accidents, falls and blunt physical contact. Suspicion for renal injury is high in trauma patients with upper abdominal pain, large flank contusions, lumbar or lower thoracic vertebral fractures or lower rib fractures. Hematuria is invariably present and gross hematuria is usually associated with more severe injuries than microscopic hematuria. Trivial abdominal trauma that results in gross hematuria may be an indication of an anatomic abnormality or tumour of the urinary tract.

**Indications to Obtain Imaging of the Kidneys in a Patient with Blunt Abdominal Trauma**

1. any gross hematuria
2. microscopic hematuria if there has been a period of shock/hypotension
3. microscopic hematuria plus physical evidence of renal injury (large flank ecchymosis, palpable flank mass)
4. microscopic hematuria plus fractures of T11, T12 ribs or T12, L1, L2 vertebral bodies seen on other x-rays
5. any associated penetrating injury to the back or flank

**Classification of Blunt Renal Trauma** (done by CT scan with IV contrast)

Stage I Contusion – microscopic or gross hematuria but imaging studies are normal
Stage II Hematoma – subcapsular or perirenal hematoma; non-expanding, no renal laceration
Stage III Minor Laceration – laceration of renal cortex; no extravasation of contrast
Stage IV Major Laceration – Laceration of parenchyma and collecting system; extravasation of contrast
Stage V Vascular – injury to main renal artery or vein; completely avulsed kidney; shattered kidney

Mortality associated with blunt renal injuries is mainly determined by the extent and severity of associated injuries.
- approximately 70% - 80% of blunt renal injuries will be **stage III** or less and can be managed non-operatively

o these patients should remain on bed rest until the hematuria clears and

serial haemoglobin measurements are done to make sure there is no occult retroperitoneal bleeding

- **stage IV** injuries may be managed operatively or non-operatively

o if the patient has no other injuries that require surgical management, a non-operative approach will be adopted
o surgery might be required for ongoing bleeding or expanding urinoma
o if the patient is going to surgery for associated injuries then the kidney is explored at the same time

- **stage V** injuries are often associated with significant liver, spleen or bowel injuries and the patients undergo surgical exploration to correct these associated injuries

o nephrectomy is usually required for stage V injuries for control of hemorrhage





## b. Ureteral Injuries:

- all penetrating injuries have the potential to injure the ureters
- hyperextension spinal injuries may be accompanied by ureteral injury
- ureteral injury is managed surgically with various procedures depending on the degree of injury, the location of the injury and the hemodynamic stability of the patient

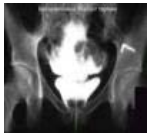
## c. Bladder Rupture:

Bladder rupture is classified as intraperitoneal or extraperitoneal (or both) depending on the cystogram x-ray findings. All patients with blunt or penetrating trauma to the lower abdomen or a pelvic fracture require a cystogram if gross hematuria is present. Classic signs or bladder injury include: blood at the urethral meatus, inability to void, perineal or scrotal hematoma and “high-riding” prostate in men.

In males, a urethral injury may be suspected if there is blood per urethra or a “high-riding” or non-palpable prostate (due to large pelvic hematoma) on rectal exam ? a catheter CANNOT be inserted for a cystogram until a retrograde urethrogram has shown the urethra to be intact

**Intraperitoneal bladder rupture:**

- most common mechanism is blunt trauma to the lower abdomen in a patient with a full bladder
- the dome of the bladder ruptures and urinary ascites develops
- this injury is more common in children since the bladder is normally an intraperitoneal structure until adolescence
- these injuries require surgical exploration and repair



**Extraperitoneal bladder rupture** (65-85% of bladder ruptures)

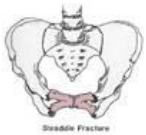
- usually seen with pelvic fractures (90+%)
- the mechanism of rupture is either direct perforation by bone fragments or shear forces created by the deforming pelvic ring
- will generally heal with conservative treatment (urethral or suprapubic catheter for 2- 3 weeks)
- surgical exploration is required if there is an associated membranous urethral disruption

## d. Urethral Injury:

Urethral injuries occur almost exclusively in males and should be suspected with any blunt trauma to the perineum e.g. straddle injuries, pubic rami fractures or direct blows to the area.

**Bulbar urethral injury. (“Straddle injury”)**

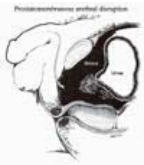
- is the most common type of urethral injury
- usually the result of direct trauma caused by falling astride an object
- clinical features include blood from meatus and perineal bruising
- if unable to pass urine, a urethral catheter should not be passed because it may convert a partial tear into a complete urethral injury
- if catheter is required it should be inserted via the suprapubic route
- diagnosis can be confirmed via retrograde urethrogram
- prophylactic antibiotics should be given
- complications include urethral stricture
- open repair may be immediate or delayed depending on the clinical situation



**Prostatomembranous Urethral Disruption.** Pelvic fractures may cause a shearing type injury to the prostatomembranous urethra. The prostate is fixed to the symphysis pubis by the strong puboprostatic ligaments and any pelvic fracture that displaces the symphysis pubis will also displace the prostate. In these situations, the urethra is torn at the junction of the prostatic urethra with the membranous urethra. Any attempt to pass a urethral catheter will fail and will likely introduce infection into the pelvic hematoma.
In partial disruption of the urethra, management can include a careful attempt at passing a catheter past the tear, but can convert the injury to a complete disruption.

Suspect this situation clinically with:

- presence of blood at the urethral meatus
- a “high-riding” prostate or a non-palpable prostate on rectal examination
- scrotal and/or perineal bruising

If any of the above clinical signs are present then a **retrograde urethrogram** is **mandatory** before any attempts are made to pass a catheter up the urethra. If a prostatomembranous urethral injury is seen on the urethrogram then a suprapubic catheter should be placed or passage of a urethral catheter in the operating room at the time of surgical exploration of the pelvis may be attempted. These injuries invariably result in difficult urethral strictures and often require urethral reconstruction procedures after the injuries have healed. Because of the proximity of the autonomic

cavernosal nerves to the apex of the prostate, impotence is not uncommon after prostatomembranous urethral disruption. Another important coconsequence of urethral injury is incontinence.