Injuries in the urinary bladder and urethra by any trauma are uncommon. The damage and rupture in these organs may occur as a consequence of blunt or penetrating trauma to the pelvis and abdomen. Only a few number of pelvic fractures lead to urinary bladder ruptures. The severity of bladder ruptures depends upon how much of the bladder was full during the time of injury and cause/causes of that injury. In earlier days, the diagnosis of urinary bladder and urethra injury was often missed or delayed due to the lack of proper knowledge and adequate medical instruments. The early diagnosis and proper treatment successfully help patients to avoid several complications.

Epidemiology of Genitourinary Trauma

Of the traumatic injuries’ patients hospitalized in the United States each year, 10% are found to have genitourinary injuries.

Kidney

The incidence of traumatic renal injury in the general population is reported to be around 4.9 per 100,000 population. Renal injuries are more common in younger people who are males. Up to 75% of those who sustain a traumatic renal injury are males. Most cases are associated with blunt trauma.

Ureter

Ureteral trauma is rare. Ureteral traumatic injuries are reported in 2.5% of all genitourinary traumatic injuries. Up to 83% of the patients are males and the average age at presentation is 23 years. Most cases are iatrogenic.
Urinary Bladder

The urinary bladder is protected by the bony pelvis, especially when it is empty. Again, urinary bladder traumatic injuries are more common in young males. Up to 3.6% of patients presenting with a pelvic fracture are expected to have a concomitant urinary bladder injury. Most cases are from blunt trauma due to motor vehicle accidents.

Urethra

Urethral traumatic injuries are rare. They account for only 4% of all genitourinary traumatic injuries. They are associated with long-term morbidity because of the increased risk of incontinence, impotence, stricture formation, and infertility. The male to female ratio is 5 to 1. Posterior urethral injuries are seen in blunt trauma patients, whereas, anterior urethral injuries are usually iatrogenic.

Classification of Traumatic Injury to the Pelvis, Bladder and Urethra

Before moving toward classification, we will explore the concepts of extraperitoneal space and intraperitoneal space and their relationship with the urinary bladder and the urethra. This will help us to better understand the location of rupture of the urinary bladder.

- **Extraperitoneal space** is the portion of the abdominal and pelvic cavity which does not lie inside the peritoneum.

- **Intraperitoneal space** is the portion of the abdominal and pelvic cavity which lies inside the peritoneum.

The urinary bladder is an extraperitoneal organ because it is not located inside the peritoneum.

Injuries to the urinary bladder are classified mainly upon their location, where each type has a different characteristic and epidemiology.

Urinary bladder injuries can be classified into **3 types**:

**Intraperitoneal urinary bladder injury**

Intraperitoneal urinary bladder injury mainly represents a blunt injury to the bladder. Mostly, the causes are direct blow or kick to that region or falling from a high place.

Intraperitoneal ruptures are not found frequently; they are noticed only in 15-20 % of the patients suffering from urinary bladder injury. In children, the urinary bladder has more intraperitoneal tendency than in adults, that’s why they are more prone to traumatic urinary injuries.

**Extraperitoneal urinary bladder injury**

The urinary bladder is situated in extraperitoneal space. This type of injuries mainly includes penetrating injuries to the bladder and occurs in about 80-85 % of the patients with urinary bladder injuries.

Sometimes, it occurs as a consequence of pelvic fracture, which, in turn, causes a penetrating wound. In some cases, a penetrating wound can be caused by knife stabbing.
Being shot with a gun in the lower abdomen can also cause extraperitoneal urinary bladder injury.

**Combined rupture**

This type of injury is very rare; this is when a simultaneous injury of the extra and intra peritoneal portions of the urinary bladder may occur.

**Causes of Traumatic Injury to the Pelvis, Bladder and Urethra**

There are two major types of injuries that may affect the urinary bladder: blunt and penetrating injuries.

**Sharp injury**

<table>
<thead>
<tr>
<th>Blunt injury</th>
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<tbody>
<tr>
<td>Kick</td>
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<tr>
<td>Height</td>
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<tr>
<td>Car Accident</td>
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</table>

**Bullet**

Bullet shots to the lower abdomen are associated with increased risk of urinary bladder injury.

**Stabbing**

Lower abdominal stabbing by a knife or any sharp instrument might be associated with bladder injury.

**Surgical trauma**

It’s a part of the iatrogenic pathogenesis. During the operation, the urinary bladder may be accidentally harmed by the surgeon. It causes surgical trauma and rupture of the urinary bladder.

**Obstetric trauma**

During surgical labor, female patients may be affected.

**Clinical Features of Traumatic Injury to the Pelvis, Bladder and Urethra**

The clinical manifestations of the intraperitoneal and extraperitoneal urinary bladder injuries are different from each other. Understanding the symptoms of both will help the clinician to differentiate between the various types of injuries.

**Signs and symptoms of intraperitoneal bladder injury**

- Patients feel sudden and severe pain in the supra pubic region. Sometimes, they may also feel diffuse pain in the lower abdominal region.
- The most common complaint of the patients is that they do not feel any desire to urinate. In many cases, blood is found in the intraperitoneal space, causing constipation due to a paralytic condition of the bowel movement.
- While palpating, a physician can feel tenderness in the supra pubic region of the patient.
- The very common results of intraperitoneal bladder rupture are peritonitis and rebound tenderness in the entire abdomen.
Signs and symptoms of extraperitoneal bladder injury

- Patients complain about periodic severe dull pain in the supra pubic region.
- Scrotal swelling can be found in male patients.
- Most of the patients complain of painful urination and sometimes inability to urinate.
- Abdominal fullness is noticed due to the lack of urination process.
- This injury is often associated with shock.

There are some general symptoms which may indicate urinary bladder injury and urethral trauma:

- Hematuria: Blood in the urine is one of the most common symptoms for urinary bladder rupture and urethra trauma.
- Renal Failure: The inability to urinate properly causes acute renal failure in the patient because of the back pressure on both kidneys (Hydronephrosis).
- Hypotension: The severe amount of blood loss causes hypotension.
- Tachycardia: The loss of a huge volume of blood causes compensatory increase in the heart rate.
- Fever: Any kind of injury or inflammation causes fever.

Diagnosis of Traumatic Injury to the Pelvis, Bladder and Urethra

Several laboratory, imaging and invasive procedures are needed for the definite diagnosis of urinary and urethral injuries.

<table>
<thead>
<tr>
<th>Urine Analysis</th>
<th>Red blood cells can be seen in the urine analysis which suggests presence of hematuria.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creatinine level</td>
<td>Bladder injury that results in acute kidney injury may cause a sudden increase in the creatinine level.</td>
</tr>
<tr>
<td>Abdominal Ultrasound</td>
<td>Abdominal U/S can be done to assess intra-abdominal fluid collection due to organ perforation. It also can assess the kidneys for evidence of hydronephrosis due to obstructive injuries.</td>
</tr>
<tr>
<td>Computer Tomography (CT)</td>
<td>The first investigation tool for any patient with blunt abdominal trauma is abdominal CT which provides information about the state of the organ. CT has largely replaced the conventional plain x-ray film or the fluoroscopic cystography in detecting bladder injuries and perforation.</td>
</tr>
<tr>
<td>CT Cytogram</td>
<td>This is the procedure in which a dye is injected through the urethra via a urethral catheter, with subsequent filling of the bladder. This is followed by abdominopelvic CT to assess for extravasation of the contrast.</td>
</tr>
</tbody>
</table>

Treatment of Traumatic Injury to the Pelvis, Bladder and Urethra

Emergency treatment

- **Intravenous fluid management:**
  If the patient is hemodynamically unstable due to ongoing loss of blood as a result of perforated bladder, intravenous fluid should be given to restore the intravascular depletion.

- **Blood transfusion:**
  If the patient has lost large amount of blood with subsequent hypovolmic shock, blood transfusion with whole blood might be needed.

- **Analgesics:**
Severe pain, especially in traumatic patients, should be relieved by administration of a strong analgesic to reduce the anxiety of the patient and avoid neurogenic shock.

- **Antibiotics:**
  Patient should be given intravenous antibiotics to avoid sepsis and septisemia.

### Treatment in intraperitoneal bladder rupture

In general, all intraperitoneal bladder injuries need **surgical intervention**. Intraperitoneal bladder ruptures cannot be cured only by the prolonged drainage of the bladder because it will continuously leak into the peritoneal cavity of the abdomen, with subsequent loss of huge amounts of blood, abdominal destination and even maybe paralytic illues.

In traumatic injuries of the bladder, the wall of the bladder needs to be closed in a two-layer fashion by running an absorbable suture around the wound to get a tight closure of the perforation.

An **indwelling catheter** should be inserted for at least two weeks to allow the leakage of the urine, giving a chance for the wound to heal appropriately. **Diagnostic cystogram** should then be done to assess whether the leakage of the contrast still occurs or not.

### Treatment of extraperitoneal bladder rupture

Extraperitoneal bladder injuries can be managed successfully and effectively with **continuous and prolonged bladder drainage** for at least two weeks, followed by assessment of healing via **cystogram**. The expected duration of healing for the most extraperitoneal bladder injuries is about 3 weeks.

Sometimes, bladder injuries with significant extraperitoneal extravasation might need to be corrected surgically. Even minor extraperitoneal injuries can be corrected surgically if the patient is undergoing a surgery for another purpose, because this facilitates the rapid healing of the injury and avoids future complications.

### Possible After-Operation Complications

Even after surgical intervention, patients can suffer from complications that might need further interventions and treatment:

- Pyelonephritis and cystitis
- Peritonitis
- Pelvic abscess
- Hemorrhage
- Paralysis of the ileus
- Retrovesicula fistula

### References

