

### Ureteral trauma:

#### Epidemiology, aetiology and pathophysiology:

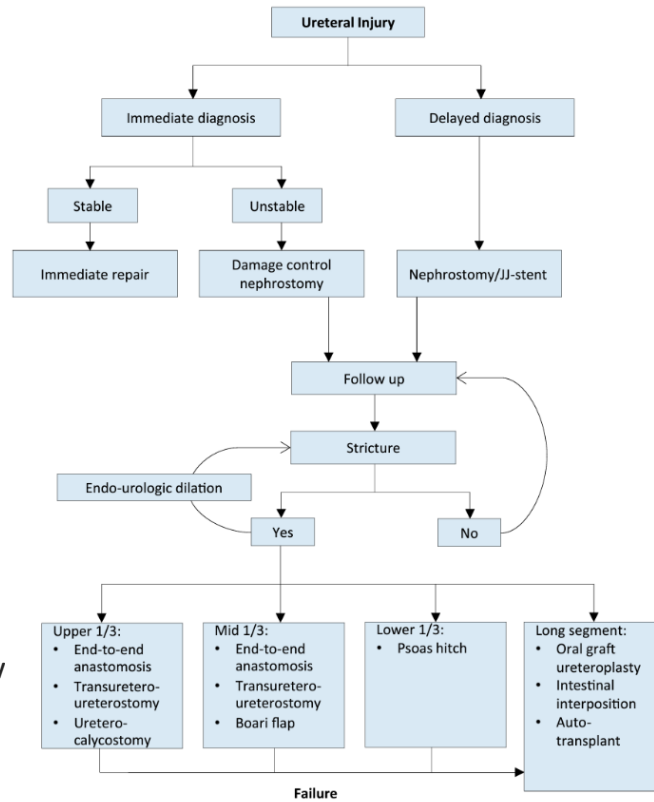
Iatrogenic trauma is the most common cause of ureteral injury (approximately 80%), and gynaecological operations are the most common cause. Basically, ureteral trauma is relatively rare as the ureters are protected from injury by their small size, mobility, and the adjacent anatomical structures. Overall, it accounts for 1-2.5% of urinary tract trauma and should be suspected in all cases of penetrating abdominal injury, especially gunshot wounds. It should also be suspected in blunt trauma with a deceleration mechanism.

#### Diagnostic evaluation and management:

Early diagnosis is very important, although diagnosis is delayed in most blunt trauma and iatrogenic cases. Pre-operative prophylactic stents do not prevent ureteral injury; however, they may assist in its detection.

Computed tomography urography is the examination of choice when ureteral injuries are suspected.

Endo-urological treatment of small ureteral fistulae and strictures is safe and effective but major injury requires ureteral reconstruction.



Recommendations	Strength rating
Visually identify the ureters to prevent ureteral trauma during abdominal and pelvic surgery.	Strong
Beware of concomitant ureteral injury in all abdominal penetrating trauma, and in deceleration-type blunt trauma.	Strong
Use pre-operative prophylactic stents in high-risk cases.	Strong
Repair iatrogenic ureteral injuries recognised during surgery immediately.	Strong
Treat iatrogenic ureteral injuries with delayed diagnosis by nephrostomy tube/JJ stent urinary diversion.	Strong
Manage ureteral strictures by ureteral reconstruction according to the location and length of the affected segment.	Strong

### Bladder Trauma:

#### Classification:

Bladder trauma is primarily classified according to the location of the injury: intraperitoneal, extraperitoneal and combined intra-extraperitoneal, and categorised by aetiology: non-iatrogenic (blunt and penetrating) and iatrogenic (external and internal).

#### Epidemiology, aetiology and pathophysiology:

##### Non-iatrogenic:

Motor vehicle accidents are the most common cause of blunt bladder injury, followed by falls and other accidents. The main mechanisms are pelvic crush and blows to the lower abdomen. Most patients with blunt bladder injury have associated pelvic fractures (60-90%) and other intra-abdominal injuries. Extraperitoneal injury is almost always associated with pelvic fractures and intraperitoneal injury is caused by a sudden rise in intravesical pressure of a distended bladder, secondary to a blow to the pelvis or lower abdomen.

##### Iatrogenic:

The bladder is the urological organ that is most commonly affected by iatrogenic injury. External iatrogenic bladder trauma occurs most often during obstetric and gynaecological procedures, followed by urological and general surgical operations. Internal iatrogenic bladder trauma mainly occurs during transurethral resection of the bladder. Risk factors are larger tumours, older age, pre-treated bladders and location at the bladder dome. Extraperitoneal perforations are more frequent than intraperitoneal ones.

#### Diagnostic evaluation:

The principal sign of bladder injury is visible haematuria. Other signs are inability to void, inadequate urine output, abdominal tenderness or distension, or signs of urinary ascites in abdominal imaging.

Absolute indications for bladder imaging: visible haematuria and a pelvic fracture or non-visible haematuria combined with high-risk pelvic fracture or posterior urethral injury. Intra-operative signs of external iatrogenic bladder trauma: extravasation of urine, visible laceration, visible bladder catheter, and blood and/or gas in the urine bag during laparoscopy. Internal bladder injury is recognised by: cystoscopic identification of fatty tissue, dark space, or bowel.

Cystography is the preferred diagnostic modality for non-iatrogenic bladder trauma and suspected iatrogenic in the post-operative setting.

#### Management:

Conservative treatment (clinical observation, continuous bladder drainage and antibiotic prophylaxis), is the standard treatment for an uncomplicated extraperitoneal injury due to blunt trauma.

Intraperitoneal bladder trauma is managed by surgical repair, although conservative treatment is suitable for uncomplicated intraperitoneal injury during endo-urological procedures, in the absence of peritonitis and ileus.

Recommendations	Strength rating
Perform cystography in the presence of visible haematuria and pelvic fracture.	Strong
Perform cystography in case of suspected iatrogenic bladder injury in the post-operative setting.	Strong
Perform cystography with active retrograde filling of the bladder with dilute contrast (300-350 mL).	Strong
Perform cystoscopy to rule out bladder injury during retropubic sub-urethral sling procedures.	Strong
Manage uncomplicated blunt extraperitoneal bladder injuries conservatively.	Weak
Manage blunt extraperitoneal bladder injuries operatively in cases of bladder neck involvement and/or associated injuries that require surgical intervention.	Strong
Manage blunt intraperitoneal injuries by surgical exploration and repair.	Strong
Manage small uncomplicated intraperitoneal bladder injuries during endoscopic procedures conservatively.	Weak
Perform cystography to assess bladder wall healing after repair of a complex injury or in case of risk factors for wound healing.	Strong