

# Bladder and urethral injuries

## Bladder injury

### Etiology

Bladder injuries most often occur as a result of blunt trauma (in up to 75% of cases) when the bladder is full at the same time (e.g. in a car accident, after a fall, collapse). This will rupture the wall of the bladder and in more than half of the cases also injure other organs and fracture the pelvis. It is also necessary to rule out an injury to the urethra (in 15% of cases, the membranous urethra is injured). Rupture of the empty bladder is relatively rare. Children are a particular risk group for the abdominal position of the bladder (above the pubic clasp).<sup>[1][2]</sup>

### Classification

By mechanism: blunt x penetrating

Clinically, the injury can be divided into 2 basic types (the classification according to AAST then expands the categories with regard to the size of the perforation to further intermediate stages)

1. **Intraperitoneal rupture** - caused by a sharp increase in pressure during bladder filling, most often in the vertex area with paravasation of fluid into the peritoneal cavity
2. **Extraperitoneal rupture** - often associated with pelvic fractures, is caused by a shearing mechanism during displacement of the pelvic ring or direct perforation by bone fragments

Iatrogenic traumas occupy a special place, as the bladder is the most frequently injured uropoietic organ. The main causes are perforation during transurethral resections (TUR) and gynecological operations (caesarean section, TVT/TOT tapes).<sup>[1][2]</sup>

### Clinical manifestations

In 80-95% of cases of **external injury**, the main symptom is macroscopic hematuria. At first glance, abrasions may be visible in the suprapubic area. Pain in the lower abdomen, inability to urinate, swelling or hematoma on the perineum, scrotum, or hematoma on the thighs may also appear.

**Iatrogenic injuries** are often visible during the procedure itself. It can be indicated by a decrease in irrigation fluid (during TUR) at the same time as the volume of the abdomen increases. During laparoscopy, gas may appear in the collection bag of the urinary catheter.

An unrecognized injury leads to hematuria, abdominal pain, ileus or peritonitis, sepsis and an increase in creatinine values after the procedure.<sup>[1][2]</sup>

### Diagnostics

The basic diagnostic examination (after anamnesis + physical examination) is X-ray cystography. Pelvic fractures are present in up to 80% of cases, which is why CT (routine full-body CT in polytrauma) is also justified. The basic examination consists of a native image, an image at full filling (during filling) and after emptying. Extravasation of the contrast material is manifested by highlighting the contours of the abdominal organs (intestinal loops, liver, spleen). Cystography is also used to check perioperative injuries during gynecological procedures. Due to its low sensitivity, ultrasound is not usually useful and is not routinely performed. It is important for the detection of free fluid in the peritoneal cavity or for the detection of hematoma. Excretory urography can then be very misleading (up to 75% of false negative findings).<sup>[1][2]</sup>

### Therapy

**Extraperitoneal injuries** in blunt or iatrogenic injuries can be solved by long-term drainage using a catheter (5-10 days) or epicystostomy. The success rate of conservative therapy is over 90% (i.e. the result is a normal finding after control cystography). Paravesical drainage must also be introduced in the event of a larger leakage of urine. If an injury to the bladder neck, bone fragments or rectal injury is suspected, it is more advantageous to choose a surgical solution supplemented with osteosynthesis (in the case of trauma associated with pelvic ring breakage) and reconstruction of the injured bladder (reduces the risk of subsequent infection of the implanted material).

Blunt injuries associated with **intraperitoneal rupture**, as well as open injuries, always require **surgical revision** and double drainage (peritoneum + bladder). Blunt injuries with intraperitoneal perforation are burdened with high mortality for associated injuries (up to 30%).

If **iatrogenic injuries** are detected immediately, they are immediately primary closed. Later diagnosed iatrogenic intraperitoneal injuries are indicated for operative revision. Only in the absence of ileus or peritonitis can a conservative procedure be considered with drainage under simultaneous ATB coverage. In the case of

extraperitoneal injury, the procedure can be conservative (bladder drainage with ATB prophylaxis). In the case of conservative treatment, the urinary catheter is left as needed for 7-14 days. Before removal, control cystography is recommended, and in case of extravasation, the catheter is left for another week.<sup>[1][2]</sup>

Open wound		Operational review
blunt force trauma	intraoperative rupture	operative revision (drainage of the peritoneum cavity, permanent urinary catheter)
	extraperitoneal rupture	conservative procedure (permanent urinary catheter, ATB prophylaxis)
iatrogenic injury	intraoperative rupture	immediate op. revision (suture, drainage, urinary catheter, ATB)
		conservative procedure (percutaneous drainage of the peritoneal cavity, urinary catheter, ATB),
	extraperitoneal rupture	conservative procedure (long-term retention of urinary catheter, ATB)

## Complications

- **Early** - extravasation, phlegmon, abscess, fistula, peritonitis, urosepsis, shock
- **Late** - urgency, incontinence

## Urethral injury

### Etiology

The most common cause of urethral injury is **iatrogenic**, mainly as a result of instrumentation - catheterization. The injury mechanism makes up a smaller part of the cases. Injury to the posterior urethra occurs as a result of large injuries to the pelvis (bone fragments) or polytrauma (tear between the prostate and the pelvic floor, a lighter form is only the puboprostatic ligaments) and rarely during catheterization. Injury to the anterior urethra most often occurs after injuries associated with a fall on perineum, a kick in the groin, a hit to the penis (or its fracture) or self-manipulation by the patient (unusual sexual practices).

Injuries to the urethra in women tend to be less frequent (self-manipulation) and less severe (less fixation to the symphysis area). On the contrary, serious injuries carry with them, in addition to associated injuries (laceration of the vagina, rectum, U-V fistula, pelvic fractures), also the risk of incontinence in the future.<sup>[1] [2]</sup>

### Classification

According to integrity violation: contusion x partial x complete, or covered x open

According to the mechanism: blunt x penetrating, or direct (caused by trauma, urinary catheterization) x indirect (bone fragments)

According to the location of the affected part of the urethra: front (pars penilis et bulbaris) x back (pars membranacea et prostatica)<sup>[1] [2]</sup>

*Classification according to AAST.<sup>[2]</sup>*

Degree	Criteria	Therapy
1	extension of the urethra, without contrast material extravasation	without therapy
2	contusion, urethrorrhagia, without extravasation	conservative (permanent catheter, epicycstostomy)
3	partial disruption of the anterior/posterior urethra, paravasation, the contrast material penetrates above the lesion site or into the bladder	conservative (permanent catheter, epicycstostomy)
4	complete disruption of the anterior urethra, paravasation, the contrast medium does not penetrate above the site of the lesion or into the bladder	open / endoscopic reconstruction (early/delayed)
5	complete disruption of the posterior urethra, paravasation, the contrast material does not penetrate the bladder	open / endoscopic reconstruction (early/delayed)
6	partial or complete lesions of the posterior urethra + neck of the bladder/vagina	early open reconstruction

## Clinical manifestations

An injury is evidence of urethrorrhagia = discharge of blood from the urethra outside of micturition. Simple hematuria is not specific, as it may simply be flushing of blood from a previous injury. Another manifestation can be dysuria, weakened flow, rarely swelling of the penis (caused by paravasation of urine) or retention (in case of injury to the posterior urethra).<sup>[1] [2]</sup>

## Diagnostics

In the anamnesis, we specifically ask about the previous injury and its possible mechanism. During a physical examination, blood in the urethral orifice (in women in the introit) or a hematoma on the penis or perineum is usually visible. History + physical examination is usually sufficient for clinical diagnosis. Micro/macrosopic hematuria is almost always present. Retrograde urethrography will then show the location and extent of the damage. It is not advisable to insert a urethral catheter blindly. For the risk of pelvic fracture, it is advisable to supplement the examination with an X-ray.<sup>[1] [2]</sup>

## Therapy

Incomplete injuries can be successfully treated by careful insertion of a bladder catheter usually under the ATB prophylaxis. If a foreign body is present in the urethra, it must first be removed (endoscopically, rarely during open surgery). For more serious injuries or when catheterization is impossible, a puncture epicystostomy is usually established. This is followed by an operative revision with a suture. Also in case of iatrogenic damage, treatment is most often solved by catheterization or epicystostomy. Healing usually takes 1-3 weeks depending on the severity of the injury.

More serious injuries associated with a violation of the pelvic ring and bulbar urethra are solved either at the time of the primary revision of the pelvis with a suture on the urethral vessel, or as a delayed reconstruction - by establishing a puncture epicystostomy with a definitive solution after the condition stabilizes (after a few months), when the result is occlusion of the urethral lumen possibly a stricture. Early reconstruction is indicated for penetrating injuries.

Urethral injury in women is most often treated with a bladder catheter or epicystostomy.<sup>[1] [2]</sup>

## Complications

The most common complications are strictures - in any part, as well as urethrocutaneous fistulas or diverticula. In the event of injury to the posterior urethra (especially in conjunction with injury to the pelvic floor), there is a real risk of incontinence or erectile dysfunction.<sup>[1] [2]</sup>

## Links

## Reference

1. HANUŠ, Tomáš a Petr MACEK. *Urologie pro mediky*. V Praze: Univerzita Karlova, nakladatelství Karolinum, 2015. ISBN 978-80-246-3008-3. Str. 38-40, 43-45
2. Prezentace z přednášky Traumatologie v urologii <https://portal.lf1.cuni.cz/clanek-996-vzdelavaci-program-urologie-1-lf-uk>