Urethral trauma

Anatomy review

- **Urogenital diaphragm**: formed by the triangular ligament that attaches anterolaterally to the pubic arch and ischium and posteriorly to the transverse perineal muscle.
  - *Lower fascia of the diaphragm*: extends anteriorly as the *Scarpa fascia* and *dartos muscle* and laterally as the *fascia lata* into the thigh.
  - *Upper fascia of the diaphragm*: extends along the pelvic fascia.
- **Division of the urethra**: the urogenital diaphragm divides the anterior and posterior urethra.
  - *Anterior urethra*: consists of the penile urethra or pendular and bulbar urethra.
  - *Posterior urethra*: consists of the membranous urethra, contained within the urogenital diaphragm, and the prostatic urethra. In women, only the posterior urethra is present.

Etiology

- **Associations**: 10-20% of all injuries to the posterior urethra are associated with bladder injury. 20% of bladder injuries in pelvic trauma are associated with urethral injury.
- **In cases of pelvic fractures** the percentage of urethral injury increases to 25%. The most commonly associated pelvic injury is bilateral fracture of the ischiopubic branches.
- **The most frequent mechanism of injury to the anterior urethra** is straddling an object.
- **Iatrogenic injury to the anterior urethra** appears between the penoscrotal junction and the bulbomembranous urethra, occurring in less than 5% of TURP procedures.

**EAU classification** *(modified Colapinto & McCallum and Goldman et al.)*

- **Grade I**: urethral stretch injury. No extravasation on urethrography. Observation.
- **Grade II**: urethral contusion. Urethral bleeding, but no contrast extravasation on urethrography. Conservative treatment with suprapubic cystostomy or urethral catheter.
- **Grade III**: partial disruption of anterior or posterior urethra. Extravasation of contrast at injury site with contrast visualized in the proximal urethra or bladder. Conservative treatment with suprapubic cystostomy.
- **Grade IV**: complete disruption of anterior urethra. Extravasation of contrast at injury site without visualization of proximal urethral or bladder. Tx: primary or delayed endoscopic or open surgery.
  - *With Buck’s fascia intact*: extravasation and hematoma contained between *Buck’s fascia* and the tunica albuginea of the corpora cavernosa.
  - *With Buck’s fascia broken*: extravasation and hematoma spread throughout the *Colles’ fascia*; may extend to the scrotum or perineum.
- **Grade V**: complete rupture of posterior urethra. Extravasation of contrast at injury site without visualization of bladder. Tx: primary or delayed open or endoscopic surgery.
- **Grade VI**: complete or partial rupture of posterior urethra + tear of the bladder neck or vagina. Tx: immediate open surgery.

Diagnosis

- **Signs**:
  - *Urethral bleeding*: the most common sign (37-93% in injuries to the posterior urethra and 75% in those to the anterior urethra). If present, it is prudent to delay placement of a urethral catheter until after urethrography. In unstable patient, insertion of a catheter can be attempted, but at the slightest difficulty, a suprapubic catheter should be used until a urethrography can be performed.
  - *Hematoma*: if it is limited to the penis, *Buck’s fascia* is most likely intact. Rupture of this fascia leads to the spread of the hematoma to the abdomen and scrotum.
- **Other**: occasionally, the prostate is elevated upon rectal palpation; possible urinary retention, etc.

- **Associated injuries**: injuries to the posterior urethra usually accompany trauma injuries, whereas those to the anterior urethra tend to be isolated or associated with penile fractures.

- **Retrograde and voiding urethrography**: must be performed aseptically. Classifies the urethral injury as a *partial* or *complete* rupture, depending on whether the contrast dye reaches the bladder.

- **IVU**: for assessing whether there is separation between the bladder and the pubis.

- **Urethroscopy**: in women, this technique is better than urethrography for evaluating the state of the urethra. In men it is used mainly in iatrogenic injuries.

### Treatment of anterior urethral injuries

- **Blunt trauma with partial rupture**: only in cases associated with corpora cavernosa rupture should the urethra be repaired simultaneously (closing over a catheter). Otherwise, a suprapubic catheter should be used for 4 weeks before performing a voiding urethrography.
  - If there is no extravasation and urination is satisfactory, the suprapubic catheter is removed.
  - If there is a short (<1 cm), soft stenosis, an internal urethrotomy can be performed.
  - If the stenosis presents ample fibrosis or if it measures >1 cm, a urethroplasty is carried out with a buccal mucosa graft or penile skin flap.

- **Blunt trauma with complete rupture**: immediate repair if the tear is associated with the corpora cavernosa; this should be by means of termino-terminal urethroplasty or with a buccal mucosa graft or penile skin flap if there is a loss of substance. If not, suprapubic cystostomy and delayed reparation (3-6 months) with anastomotic urethroplasty for a short stenosis and a graft or flap for a longer stenosis.

- **Penetrating trauma**: requires immediate cleansing, surgical exploration, and repair. Due to risk of contamination and/or devitalization, primary repair should be avoided if the defect measures >1-2 cm. This requires marsupialization of the urethra, the insertion of a suprapubic catheter, and delayed repair after 3-6 months.

### Treatment of posterior urethral injuries

- **Partial rupture of the posterior urethra**: conservative management with a suprapubic catheter for 4 weeks followed by urethrography:
  - In short stenoses, an internal urethrotomy is performed.
  - In long stenoses, bulboprostatic anastomotic urethroplasty is performed.

- **Complete rupture of the posterior urethra**: 5 options must be evaluated:
  - **Immediate open primary urethral realignment**: indicated if there is an associated injury of the bladder neck, vagina, or rectum. Consists of the evacuation of the hematoma, surgical exploration, repair of associated injuries, and realignment of the urethra over a catheter. Avoid vigorous traction with the catheter and/or traction sutures to prevent injury to the internal sphincter (bladder neck). Urethroplasty should not be performed immediately due to problems in identifying structures and high rates of impotence/incontinence.
  - **Deferred endoscopic primary urethral realignment**: a suprapubic catheter is inserted and after 10-14 days, if the patient is stable and can be placed in lithotomy position, a combined endoscopic transurethral and suprapubic approach is used to insert a urethral catheter. *Advantages*: avoids the need for delayed urethroplasty in 1/3 of patients; in the rest it facilitates an internal urethrotomy. *Disadvantages*: leads to higher rates of impotence (35%) and incontinence (5%) than delayed urethroplasty.
  - **Delayed primary urethroplasty**: a suprapubic catheter is put into place and after 10-14 days the hematoma is evacuated and an anastomotic urethroplasty is performed. This is
probably the best choice in women. Can be performed in men with a large separation of the urethral ends, provided they are stable and can be placed in lithotomy position.

- **Delayed urethroplasty:** a suprapubic catheter is inserted and after 3-6 m a bulboprostatic anastomotic urethroplasty is performed. This is the gold standard technique in men (due to its lower rates of impotence and incontinence), either as a first-line treatment or after other techniques have failed. In defects >8 cm or if the injury is associated with fistulas or spongiofibrosis of the anterior urethra, a two-step repair is preferable, with a buccal mucosa or meshed skin graft.

- **Delayed endoscopic urethrotomy:** useful only in very short blind stenosis, otherwise restenosis is almost certain to occur. A combined suprapubic / transurethral technique should be used.
Management of posterior urethral trauma in men

VCUG + Physical exam

Urethral contusion
- Transurethral or suprapubic catheter
- Blunt trauma
  - Unstable patient
    - Suprapubic cystostomy
    - 4 weeks
  - Stable patient
    - Open primary re-alignment
    - 3-6 m

Partial rupture
- Blunt trauma
  - Unstable patient
    - Suprapubic cystostomy
    - 3-6 m
  - Stable patient
    - Endoscopic urethrotomy
    - if failure
      - Delayed urethroplasty
      - 3-6 m
    - No stenosis
      - Follow-up
      - No stenosis
      - 3-6 m
      - Short stenosis
      - Delayed urethroplasty
      - 3-6 m
      - Long stenosis
      - Delayed urethroplasty
      - 3-6 m

Complete rupture
- Blunt trauma
  - With associated bladder or rectal tear
    - Suprapubic cystostomy
    - 3-6 m

Option: Primary endoscopic re-alignment after 10-14 days
Management of anterior urethral trauma in men

VCUG + Physical exam

Urethral contusion
- Transurethral or suprapubic catheter

Partial rupture
- Blunt trauma

Complete rupture
- Penetrating trauma
  - With penile rupture
    - Primary urethral repair:
      - Short stenosis: primary urethroplasty.
      - Long stenosis: marsupialization (deferred graft/penile skin flap).

No stenosis
- Follow-up

Short (<1 cm) and soft stenosis
- Endoscopic urethrotomy
  - if failure: Graft/flap urethroplasty

Long (>1 cm) or fibrous stenosis
- Follow-up
Management of urethral trauma in women

Hematuria or blood at the vaginal introitus or labial injury/swelling → Urethroscopy

- No lesions at bladder/urethra → Follow-up
- Injured bladder neck/urethra → Suprapubic cystostomy (14 days) → Delayed primary repair
  - Bladder neck or proximal urethral injury → Retropubic repair
  - Distal urethral injury → Transvaginal repair