

GUIDELINES ON UROLOGICAL TRAUMA

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Renal Trauma

Background

Renal injuries (RI) account for 1-5% of all traumas and are classified as blunt or penetrating. Blunt trauma accounts for the largest percentage, while gunshot and stab wounds cause the majority of penetrating injuries.

Table 1: Injury severity scale for the kidney**

Grade	Description
1	Contusion or non-expanding subcapsular haematoma, no laceration
2	Non-expanding perirenal haematoma, cortical laceration <1 cm deep without extravasation
3	Cortical laceration >1 cm without urinary extravasation
4	Laceration: through corticomedullary junction into collecting system or vascular: segmental renal artery or vein injury with contained haematoma
5	Laceration: shattered kidney or vascular: renal pedicle injury or avulsion

* Adapted from the American Association for the Surgery of Trauma (AAST).

** Advance one grade for multiple injuries up to grade III.

Diagnosis

- Obtain time and setting of incident, past renal surgery, known renal abnormalities (ureteropelvic junction obstruction, large cysts, urolithiasis).
- Examine thorax, abdomen, flanks and back for penetrating wounds. (Haematuria, flank pain, flank abrasions/ecchymoses, fractured ribs, abdominal tenderness, distension or mass, indicate possible RI).
- Inspect urine from trauma patients grossly and then by dipstick analysis. Serial haematocrit measurement indicates blood loss. Creatinine measurement highlights patients with baseline impaired renal function.
- Blunt trauma patients with macroscopic or microscopic haematuria (at least 5 rbc/hpf) with hypotension, a history of rapid deceleration injury and/or significant associated injuries should undergo radiographic evaluation.
- Patients with any degree of haematuria after penetrating abdominal or thoracic injury also require urgent imaging.
- A CT scan with enhancement of intravenous contrast material is the best study for staging RIs in haemodynamically stable patients. Patients requiring exploration should undergo an intraoperative one-shot IVP with bolus intravenous injection of 2 mL/kg contrast. Ultrasonography may be helpful during the primary evaluation or follow-up of recuperating patients. Formal IVP, MRI and radiographic scintigraphy are second-line methods of imaging. Angiography can be used for diagnosis and simultaneous selective embolization of bleeding vessels if necessary.

Treatment

Indications for surgical management include haemodynamic instability, exploration for associated injuries, expanding or pulsatile perirenal haematoma identified during laparotomy, a grade 5 injury and incidental finding of pre-existing renal pathology requiring exploration (figures 1 and 2).

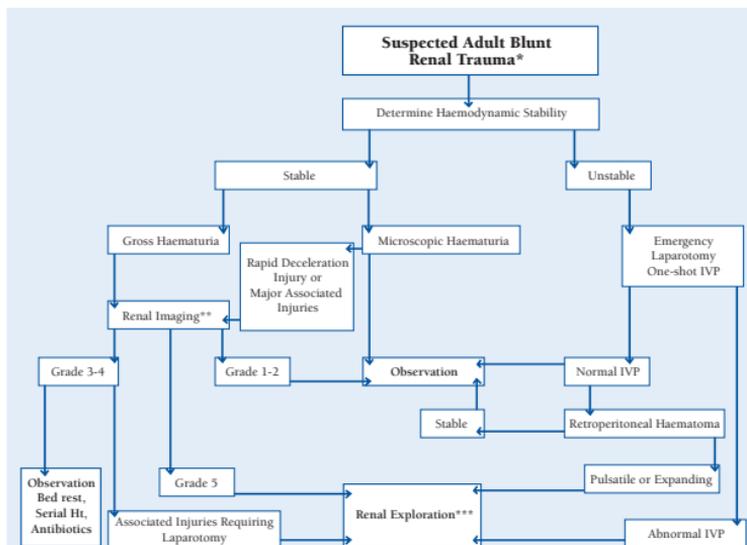


Figure 1: Evaluation of blunt renal trauma in adults

- * Suspected renal trauma results from reported mechanism of injury and physical examination.
- ** Renal imaging: CT scans are the gold standard for evaluating blunt and penetrating renal injuries in stable patients. In settings where the method is not available, the urologist should rely on other imaging modalities (IVP, angiography, radiographic scintigraphy, MRI).
- *** Renal exploration: although renal salvage is a primary goal for the urologist, decisions concerning the viability of the organ and the type of reconstruction are made during the operation.

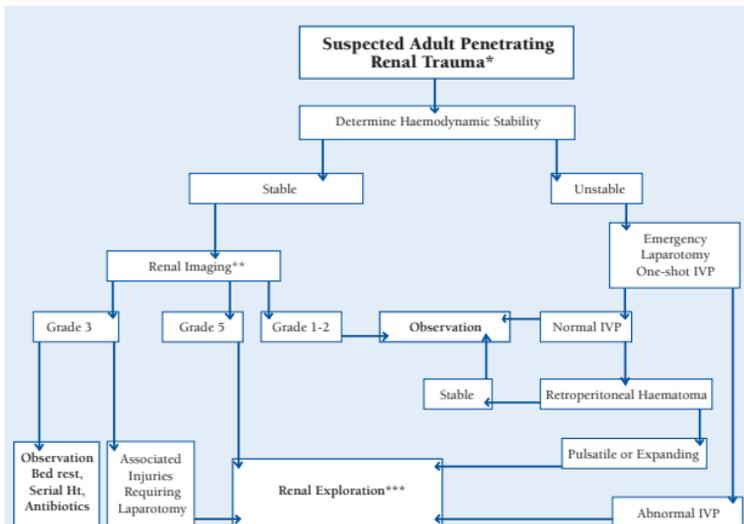


Figure 2: Evaluation of penetrating renal trauma in adults

- * Suspected renal trauma results from reported mechanism of injury and physical examination.
- ** Renal imaging: CT scans are the gold standard for evaluating blunt and penetrating renal injuries in stable patients. In settings where the method is not available, the urologist should rely on other imaging modalities (IVP, angiography, radiographic scintigraphy, MRI).
- *** Renal exploration: although renal salvage is a primary goal for the urologist, decisions concerning the viability of the organ and the type of reconstruction are made during the operation.

Post-operative care, follow-up and complications

The role of repeat imaging is unknown. Some experts recommend repeat imaging within 2-4 days following RI. Nuclear scintigraphy is useful for documenting functional recovery. Within 3 months of major RI, patients follow-up should involve physical examination, urinalysis, individualized radiological investigation, serial blood pressure measurement and serum determination of renal function. Long-term follow-up

should be decided on a case-by-case basis, but should include monitoring for renovascular hypertension after severe renal injury.

Complications (bleeding, infection, perinephric abscess, sepsis, urinary fistula, hypertension, urinary extravasation, urinoma, hydronephrosis, calculus formation, chronic pyelonephritis, arteriovenous fistula and pseudoaneurysms) require a thorough radiographic evaluation. Medical management and minimally invasive techniques should be the first choice, while renal salvage should be attempted when exploration is necessary. Nephrectomy may be required.

Paediatric renal trauma

Indications for radiographic evaluation include blunt and penetrating trauma with any level of haematuria, patients with associated abdominal injury regardless of the urinalysis findings, patients with normal urinalyses who sustained a rapid deceleration event, direct flank trauma, or a fall from height.

- CT scan is the imaging study of choice.
- Non-operative management for Grade 1-2 RIs is recommended.
- Haemodynamic instability and a diagnosed Grade 5 injury are indications for exploration.
- Treatment of other injury grades should be non-surgical whenever possible.

Ureteral Trauma

Background

External trauma to the ureter is rare. Seventy-five percent of ureteral injuries are iatrogenic, 18% from blunt trauma, and 7% from penetrating trauma. The most common site of injury is the lower third (74%).

Table 2: Injury severity scale for the ureter*

Grade	Description
1	Haematoma only
2	Laceration < 50% of circumference
3	Laceration > 50% of circumference
4	Complete tear < 2 cm of devascularization
5	Complete tear > 2 cm of devascularization

* Adapted from the AAST.

Diagnosis

There are no classic symptoms and signs. The *sine qua non* is extravasation of radiological contrast material. The diagnosis is most often made with intraoperative one-shot IVP and CT scans. If the CT scan is non-diagnostic, then an IVP and a retrograde pyelography should be undertaken.

Treatment

Partial tears can be managed with ureteral stenting or by placement of a nephrostomy tube. If a Grade 2 or 3 injury is encountered during immediate exploration of an iatrogenic injury, then primary closure of the ureteral ends over a stent is recommended. Immediate nephrectomy should only be undertaken when UI complicates the repair of a vascular procedure in which a prosthesis is to be implanted. In complete

injuries the type of reconstructive repair procedure depends on the nature and site of the injury. The options are:

1. Upper third: uretero-ureterostomy or transuretero-ureterostomy or ureterocalycostomy.
2. Middle third: uretero-ureterostomy or transuretero-ureterostomy or Boari flap and reimplantation.
3. Lower third: direct reimplantation or psoas hitch or Blandy cystoplasty.
4. Complete ureteral loss: ileal interposition (delayed) or autotransplantation (delayed).

Bladder Trauma

Background

Blunt trauma accounts for 67-86% of bladder ruptures (BR), is primarily caused by motor vehicle accidents and may be classified as extraperitoneal or intraperitoneal.

Table 3: Injury severity scale for the bladder*

Grade	Description
1	Haematoma- Contusion, intramural haematoma Laceration- Partial thickness
2	Laceration- Extraperitoneal bladder wall laceration < 2 cm
3	Laceration- Extraperitoneal (> 2 cm) or intraperitoneal (< 2 cm) bladder wall laceration
4	Laceration- Intraperitoneal bladder wall laceration > 2 cm
5	Laceration- Intraperitoneal or extraperitoneal bladder wall laceration extending into the bladder neck or ureteral orifice (trigone)

* Adapted from the AAST.

Diagnosis

The most common signs and symptoms are:

- Gross haematuria, abdominal tenderness, inability to void, suprapubic bruising, and abdominal distension.
- Extravasation of urine may result in swelling in the perineum, scrotum and/or anterior abdominal wall.
- The combination of pelvic fracture and gross haematuria constitutes an indication for cystography. In patients with pelvic fracture and microhaematuria, imaging should be reserved for those with anterior rami fractures (straddle fracture) or Malgaigne type severe ring disruption (figure III).
- Retrograde cystography is considered the standard diagnostic procedure. The bladder must be distended by the instillation of 350 mL of contrast media. A post-drainage film must be obtained. CT cystography is an excellent alternative technique.

Treatment

- Extraperitoneal ruptures can be managed by catheter drainage only.
- Bladder neck involvement, the presence of bone fragments in the bladder wall, or entrapment of the bladder wall necessitates open repair.
- Intraperitoneal ruptures are managed by surgical intervention.

Urethral Trauma

Background

Injuries to the posterior urethra (PU) occur with pelvic fractures, mostly as a result of motor vehicle accidents. The male PU is injured in 4-19% of pelvic fractures, and the female

urethra in 0-6% of all pelvic fractures. The combination of straddle fractures with diastasis of the sacroiliac joint has the highest risk of urethral injury. Prostatomembranous urethral injuries can vary from simple stretching to partial rupture to complete disruptions. Urethral injuries in women are rare events. For children, urethral injuries tend to follow the same mechanism of injury as in adults, although injuries to the prostate and bladder neck may be more common.

Injuries to the anterior urethra (AU) are caused by intercourse (penile fracture), penetrating trauma and placement of penile constriction bands.

Table 4: Injury severity scale for the urethra*

Group	Description
1	Contusion - Blood at the urethral meatus; normal urethrogram
2	Stretch - Elongation of the urethra without injury
3	Partial disruption - Extravasation of contrast at injury site with contrast visualized in the bladder
4	Complete disruption - Extravasation of contrast at injury site without visualization in the bladder; < 2 cm of urethral separation
5	Complete disruption - Complete transection with > 2 cm urethral separation, or extension into the prostate or vagina

* Adapted from the AAST.

Diagnosis

- In the absence of blood at the meatus or haematoma, a urological injury is unlikely and will be rapidly excluded by catheterization. Blood at the meatus is present in 37-93% of patients with PU injury and in at least 75% of patients with AU injury. Its presence should preclude urethral instrumentation until the entire urethra is imaged. In an unstable patient, an attempt can be made to pass a urethral catheter, but if there is any difficulty a suprapubic catheter is inserted and a retrograde urethrogram performed later. However, if a urethral injury is suspected, urethrography prior to attempted catheterization is recommended.
- Blood at the vaginal introitus is present in more than 80% of female patients with pelvic fractures and co-existing urethral injuries.
- Although non-specific, haematuria on a first voided specimen may indicate urethral injury. The amount of urethral bleeding correlates poorly with the severity of injury. Pain on urination or inability to void suggests urethral disruption. With AU trauma, the pattern of the haematoma can be useful in identifying the anatomical boundaries violated by the injury. A high-riding prostate is an unreliable finding.
- Retrograde urethrography is the gold standard for evaluating urethral injury. If delayed primary repair is contemplated, and when the proximal urethra in a simultaneous cystogram and urethrogram is not visualized, either magnetic resonance imaging (MRI) of the posterior urethra or endoscopy through the suprapubic tract can be used to define the anatomy of the posterior urethra. In females, urethroscopy may be an important adjunct for the identification and staging of urethral injuries.

Treatment

While intervention should be guided by the clinical circumstances, the following algorithms are suggested for the treatment of urethral injuries in males and females (figures 3-5).

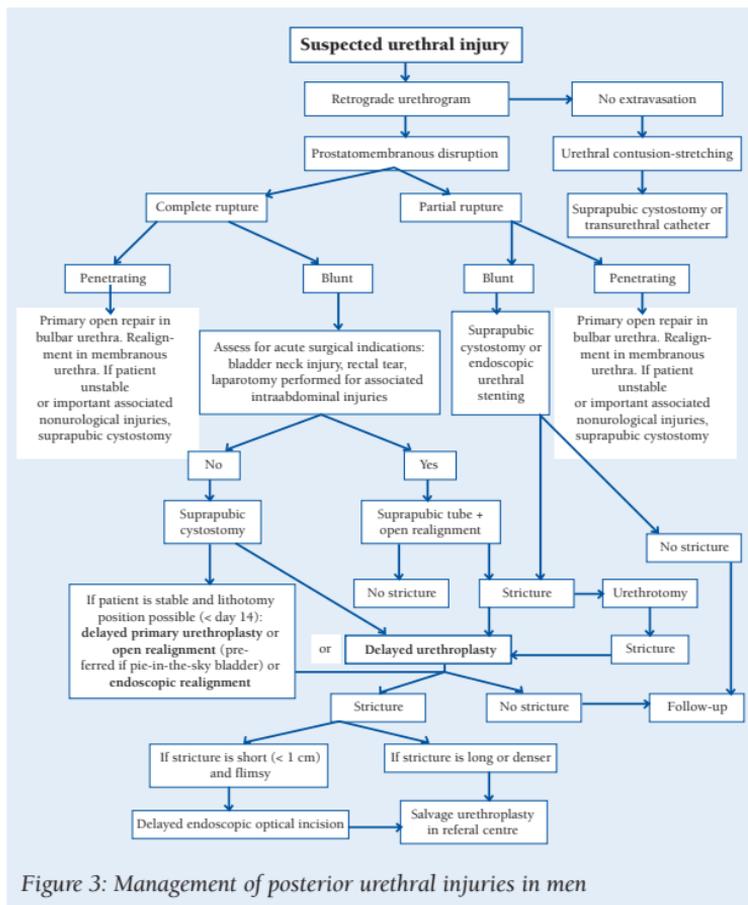


Figure 3: Management of posterior urethral injuries in men

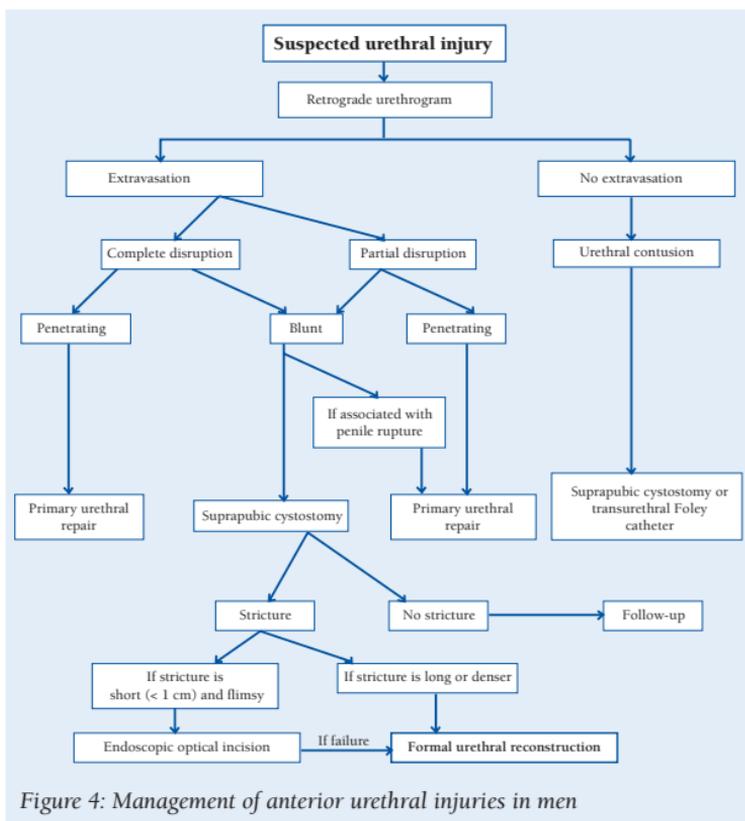
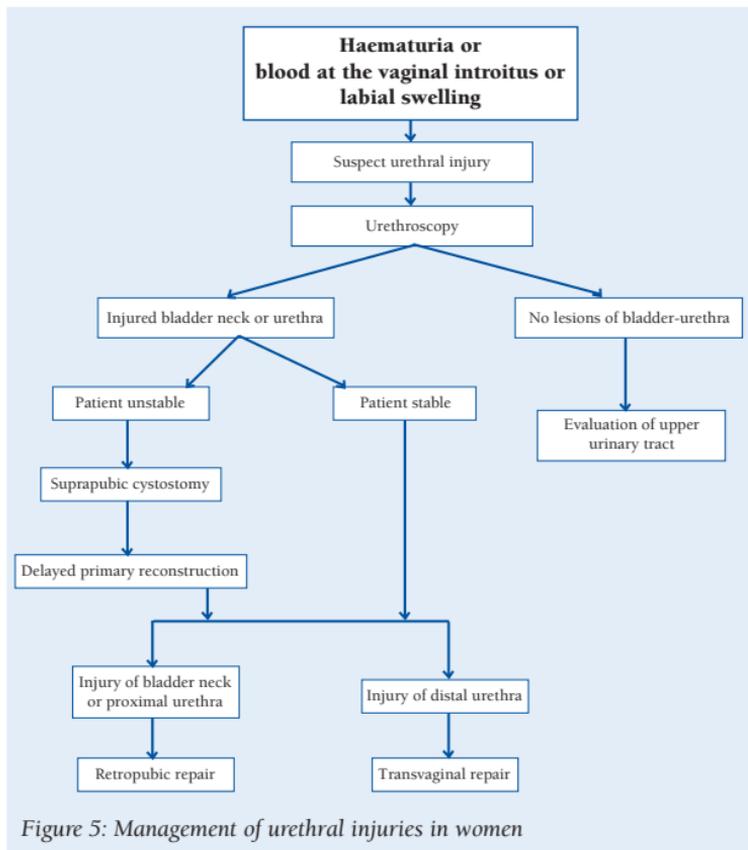


Figure 4: Management of anterior urethral injuries in men



Complications

The risk of impotence caused by delayed urethroplasty is about 5% and the rate of incontinence is about 4%.

Genital Trauma

Background

A direct blow to the erect penis may cause penile fracture. Blunt trauma to the scrotum can cause testicular dislocation, testicular rupture and/or subcutaneous scrotal haematoma. Traumatic dislocation of the testicle occurs mostly in victims of car or motorcycle accidents, or in pedestrians run over by a vehicle. Testicular rupture is found in approximately 50% of direct blunt traumas to the scrotum.

In females, blunt trauma to the vulva is rare. Penetrating trauma to the external genitalia is frequently associated with injuries to other organs.

In children, penetrating injuries are seen after straddle-type falls or laceration of genital skin due to falls on sharp objects.

Diagnosis

- Information about the accident should include: involved persons, animals, vehicles and weapons.
- Patients with penile fracture report a sudden cracking or popping sound associated with local pain and immediate detumescence.

Table 5: Injury severity scale for the penis*

Group	Description
1	Cutaneous laceration/contusion
2	Buck's fascia (cavernosum) laceration without tissue loss
3	Cutaneous avulsion/laceration through glans/meatus/cavernosal or urethral defect < 2 cm
4	Cavernosal or urethral defect > 2 cm/partial penectomy
5	Total penectomy

* Adapted from the AAST.

Table 6: Injury severity scale for the scrotum*

Group	Description
1	Contusion
2	Laceration < 25% of scrotal diameter
3	Laceration \geq 25% of scrotal diameter
4	Avulsion < 50%
5	Avulsion \geq 50%

* Adapted from the AAST.

Table 7: Injury severity scale for the testis**

Group	Description
1	Contusion or haematoma
2	Subclinical laceration of tunica albuginea
3	Laceration of tunica albuginea with < 50% parenchymal loss
4	Major laceration of tunica albuginea with \geq 50% parenchymal loss
5	Total testicular destruction or avulsion

* Adapted from the AAST.

+ Advance one grade for bilateral lesions up to grade V

Table 8: Injury severity scale for the vulva*#

Group	Description
1	Contusion or haematoma
2	Laceration, superficial (skin only)
3	Laceration, deep into fat or muscle
4	Avulsion; skin, fat or muscle
5	Injury into adjacent organs (anus, rectum, urethra, bladder)

* Adapted from the AAST.

Advance one grade for bilateral lesions up to grade V

Table 9: Injury severity scale for the vagina*#

Group	Description
1	Contusion or haematoma
2	Laceration, superficial (mucosa only)
3	Laceration, deep into fat or muscle
4	Laceration, complex, into cervix or peritoneum
5	Injury into adjacent organs (anus, rectum, urethra, bladder)

* Adapted from the AAST.

+ Advance one grade for bilateral lesions up to grade V

Treatment

Penile trauma

- Subcutaneous haematoma, without rupture of the cavernosal tunica albuginea and no immediate detumescence of the erect penis can be managed with non-steroidal analgesics and ice-packs.
- Penile fracture: immediate surgical intervention with closure of the tunica albuginea is recommended.
- Penetrating penile trauma: surgical exploration and conservative debridement of necrotic tissue is recommended with primary closure in most cases.

Scrotal trauma

- Blunt trauma with subcutaneous haematoma: conservative management.
- Large haematocele or testicular rupture: surgical exploration with excision of necrotic testicular tubules and closure of the tunica albuginea is recommended.
- Traumatic dislocation of the testis: can be manually replaced but secondary orchidopexy is recommended.

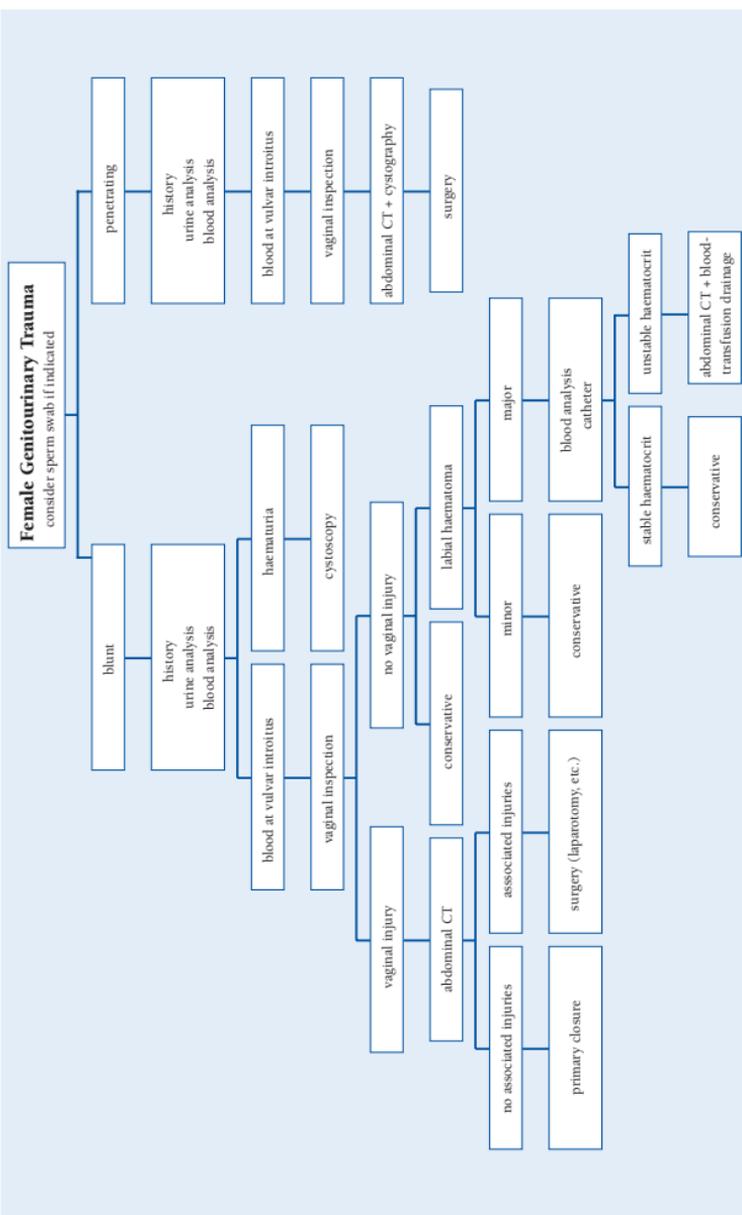
(If manual reposition cannot be performed, *in situ* orchi-dopexy is indicated).

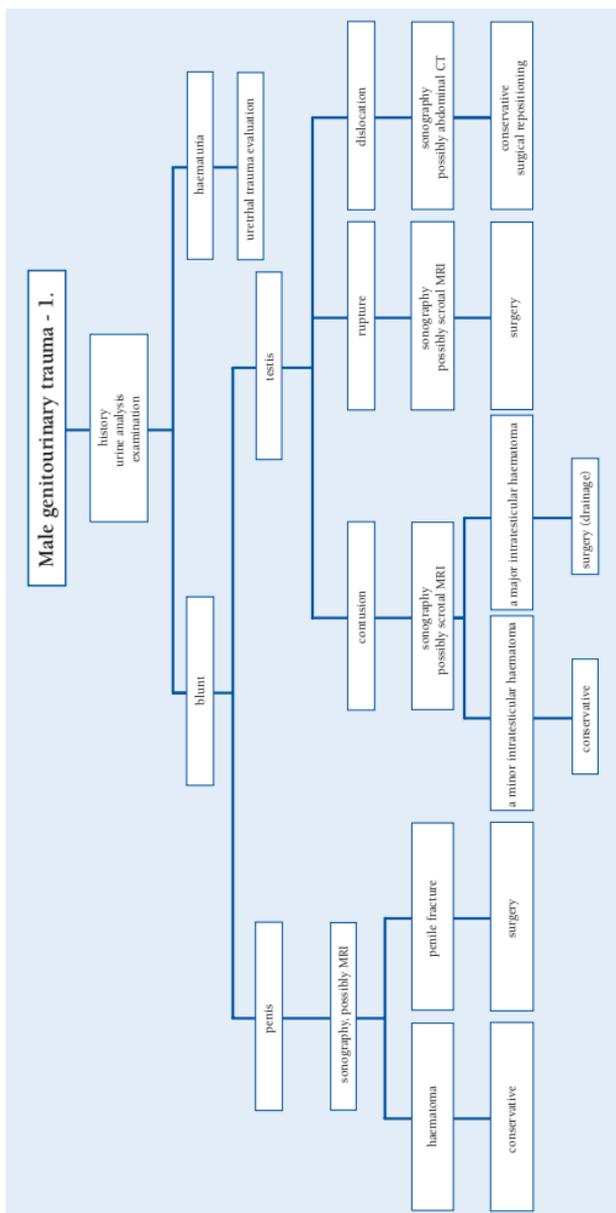
- Extended laceration of scrotal skin: surgical intervention for skin closure.
- Penetrating injuries to the scrotum: surgical exploration with conservative debridement of non-viable tissue.
- Extensive destruction of the tunica albuginea: mobilization of a free tunica vaginalis flap can be obtained for testicular closure.
- Complete disruption of the spermatic cord: realignment without vaso-vasostomy can be performed.

Female genital trauma

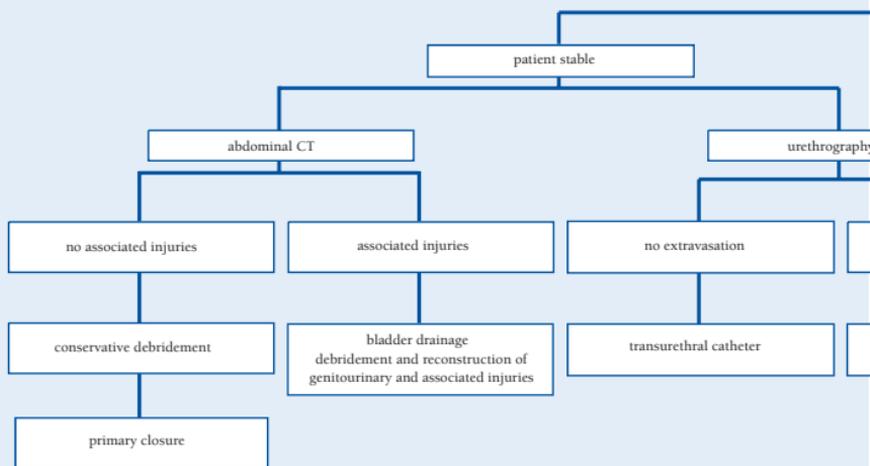
- Blunt trauma to the vulva commonly presents as haematomas: non-steroidal antirheumatics and cold packs relieve pain.
- Extended vulvar haematoma or haemodynamically unstable patients: surgical intervention may be indicated.
- Vulvar laceration: repair after conservative debridement is indicated.
- Vaginal lesion: abdominal CT scan for exclusion of additional injuries; if so, transabdominal approach for defect repair.

This short booklet is based on the more comprehensive EAU guidelines (ISBN 90-70244-06-3), available to all members of the European Association of Urology at their website - <http://www.uroweb.org>.





Male



Male genitourinary trauma 2.

